

FARM CHEMICALS

May Volume 122 No. 5 50 Cents

Pioneer Journal of the Industry



**How to train your
salesmen to create
product acceptance**

How a Filmstrip Can
Sell Farm Chemicals

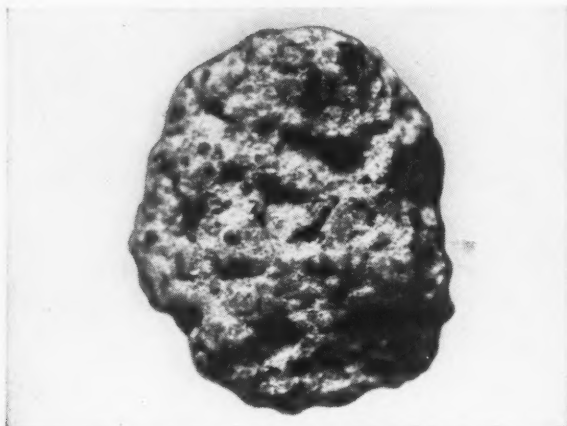
Late Research With
Triazine Compounds

Report on Tote System

Team up Cyanamid's phosphate products and services for superior mixed fertilizers, economically produced

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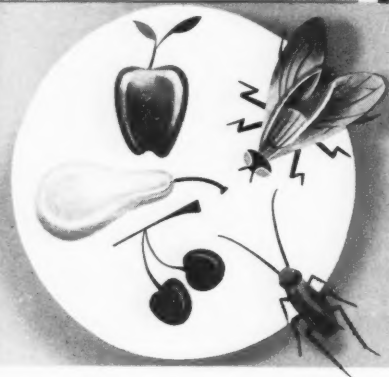
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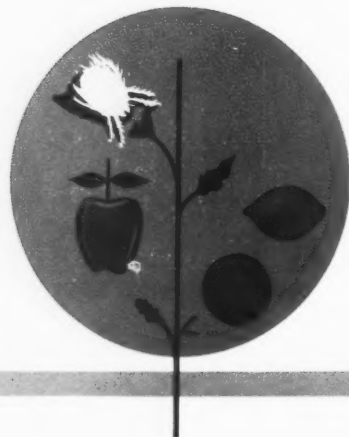
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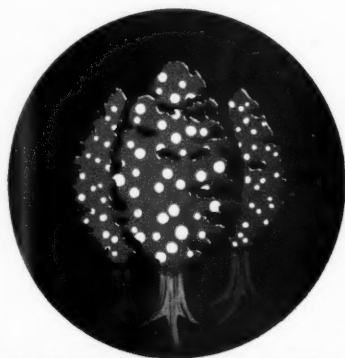
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MEMBER BUSINESS PUBLICATIONS AUDIT

The national business magazine for the fertilizer and pesticide industries, **FARM CHEMICALS**, serves primarily those persons responsible for management, marketing and production. It has a qualified circulation for selected executive and supervisory persons within specified segments of these industries, as well as in certain closely allied fields. Subscription rates to all others are: in the U.S., its possessions, Canada, Cuba and Panama: \$6.00; in other countries: \$7.50. Single copy 50 cents. Established in 1894 as *The American Fertilizer*.

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THE COVER PICTURE

The moment every salesman works hard to achieve—but many times misses by a country mile! The happy scene on this month's cover comes from an outstanding filmstrip entitled "4 Steps to Profitable Plant Food Sales." Many readers may have had an opportunity to "meet" the characters involved at such sales clinics as the recent NPFI Fertilizer Salesmen's School. The article on pages 18-19 explains how to use a filmstrip in your sales training.

Farm Chemicals Photo by Ralph Everett

FARM CHEMICALS

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Chase customers call the tune—and Chase follows through. The key to our whole business is giving *you* the bags you want, when *you* want them, made right, and priced right. But it doesn't end with filling your order . . . Chase continues working in complete harmony with you . . . making available the newest and most efficient materials, helping cut costs, eliminating waste, by individualized attention to your requirements. Some may call it "extra" service . . . at Chase, we know it's the *ONLY* right way to serve you.



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LETTERS

FC
C

Baltimore, Md.

Your article on Credit was certainly a vast improvement on my poor words at the National Credit Conference. As you well know, my remarks there were largely inspired by Raoul Allstetter and Moyle Williams who, in my opinion, are doing a constructive job for agriculture.

Sincerely,
W. E. McGUIRK, JR.
President
DAVISON CHEMICAL CO.
DIV. OF W. R. GRACE & CO.

FC'S NEW FORMAT

Atlanta, Georgia

... I like your new FARM CHEMICALS magazine. Since I am in production, I am particularly interested in Production Methods, Technical Review and Materials Handling.

We will very soon be in the midst of a revolution in this part of the country because granulation is moving in on us. This will require more know-how and we try to read everything available on this

subject. The only catch is that everyone has a different opinion on how this should be done. Having different opinions expressed in your magazine would be a great benefit.

I think your magazine is doing a fine job for the fertilizer industry...

Yours very truly,
QUENTIN S. LEE
Director, Plant Food Production
THE COTTON PRODUCERS
ASSN.

Philadelphia, Pa.

Congratulations on your article "Now Is The Time To Plan Your Fair Exhibit."

You have rendered a real service to your clients. I am sure you hope, certainly we do, that they will take your article and use it to their real benefit in the handling of their trade show and fair exhibits...

Cordially yours,
BLAKELEY B. DEMPSTER
GENERAL EXHIBITS INC.

ABOUT THE COMPLETE LIQUIDS ARTICLE

Monroe, La.

... I reviewed the article in the April issue of FARM CHEMICALS. In my opinion it is a fairly complete report and fairly appraises the liquid fertilizer industry.

Sincerely yours,
NELSON D. ABELL
OUACHITA FERTILIZER &
CHEMICAL CO.

Rocky Mount, N.C.

... Knowing Pete Crolus so well, I was not surprised to find such a well written and informative article. To say the least, this important and fast growing segment of the fertilizer industry should not be overlooked or ignored. It is my personal feeling that Complete Liquids, in the next few years, will grow to the point where some of its opponents will neither be able to overlook nor ignore them.

More such fine articles—particularly with reference to the distribution and application of liquids and its close association with Direct Application of Nitrogen Solutions—would make welcome reading for many in the fertilizer industry.

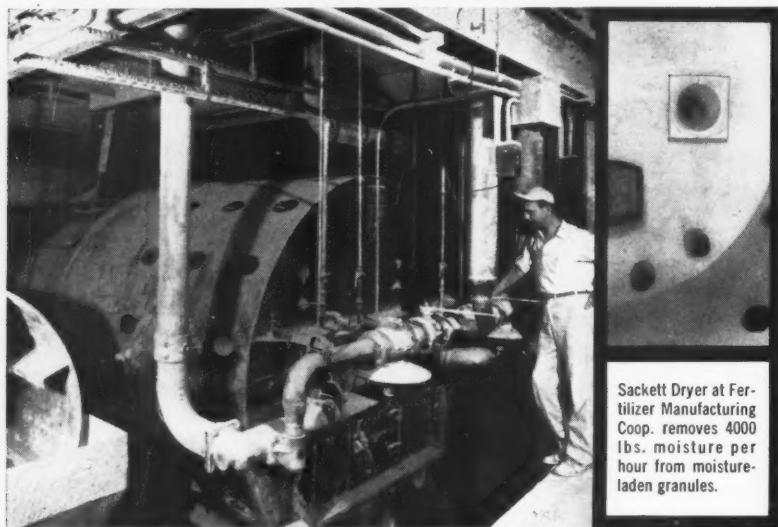
Sincerely yours,
H. S. SURLS, JR.
PLANTERS COTTON OIL &
FERTILIZER CO.
and Vice President,
NATIONAL FERTILIZER
SOLUTIONS ASSN.

ON STORED GRAIN INSECT CONTROL

Manhattan, Kans.

... I think that you did a fine job in reviewing our Stored Grain Insect Conference proceedings and boiling it down to a readable and informative article. I am pleased that we could be of assistance to you...

Sincerely yours,
DONALD A. WILBUR
Professor,
Dept. of Entomology
KANSAS STATE COLLEGE



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... reports Albert Spillman, general manager of Fertilizer Manufacturing Coop.

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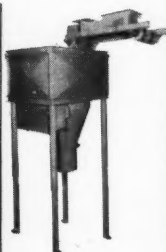
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FIELD REPORT

TO:	B.D.
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TO: B.D.
[REDACTED]'s Order
Re: Herewith [REDACTED]

U.D.
[REDACTED]'s Order
Herewith [REDACTED]'s carload order. Looks like beginning of good volume from this account. Their P.A. really opened up when I showed him our Written Guarantee policy. Explained to him that every Hudson bag he pays for is guaranteed to be a bag he can use. Or we pay for anything like this before. Please [REDACTED] Certificate with [REDACTED]

He'd never known anything like this before. He'd be sure to include validated Guarantee Certificate with your confirmation. Also give him full details on our Design Service. He's interested.

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your sales
— cut your
costs!



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WHAT'S DOING IN THE INDUSTRY

F
C

NAC SUPPORTS PROPOSED PESTICIDE ACT AMENDMENT

A new bill affecting the pesticide industry was introduced in the House of Representatives on April 15 by Harold D. Cooley (D., N. C.), chairman of the House Committee on Agriculture.

This bill, H.R. 6436, would amend the Federal Insecticide, Fungicide, and Rodenticide Act to extend its coverage to include defoliant, nematocides, desiccants and plant regulators. This would be done primarily by expanding present definition of "economic poison" in that act to include the above products.

The National Agricultural Chemicals Association, which is supporting the legislation, reports that the amendment "does not change the substantive provisions of the Act as they relate to presently regulated products."

PRIMARY PLANT FOOD SUPPLY TO BE UP 8%

Domestic supplies of nitrogen, phosphate and potash materials for 1958-59 are expected to total 7,300,000 tons—an increase of more than 8 per cent over 1957-58 supplies—predicts USDA's "Fertilizer Situation for 1958-59" released late last month.

Nitrogen supply available for fertilizer purposes is estimated to be

2,602,000 tons of N, 6.7 per cent more than was reported for 1957-58;

Phosphatic materials supply for fertilizer use in 1958-59 is expected to total 2,539,000 tons of P_2O_5 , a 5.7 per cent increase over 1957-58, the report predicts, and

Supply of K_2O for fertilizers is estimated at 2,159,000 tons, 13.3 per cent more than the previous year.

FAO ESTIMATES 5% INCREASE IN WORLD FERTILIZER USE

At least a 5 per cent increase in world fertilizer use during the fertilizer year ending June 30, 1959 is estimated by the Food and Agricultural Organization of the United Nations.

In its "Review of World Production and Consumption of Fertilizers," FAO reports that North America and Europe still produce and consume between 80 and 90 per cent of total world supplies of fertilizers.

For the three years from July 1, 1956 to June 30, 1959, the report estimates percentage increase in world fertilizer use as follows: Nitro-

gen—24 per cent, phosphoric acid—17 per cent, potash—20 per cent, all fertilizers, 20 per cent.

DOW AGROCHEMICALS TO BUILD FACTORY IN ENGLAND

Dow Agrochemicals, Ltd., will build a plant in King's Lynn, Norfolk, England, to manufacture Dowpon under license from The Dow Chemical Co.

Dow Agrochemicals was formed last year in partnership between Dow and Dr. W. E. Ripper, who is managing director of Dow Agrochemicals.

A dock-side site covering 66 acres has been acquired. Initial investment will be in the neighborhood of \$2,000,000 (M).

AERIAL APPLICATORS CONVENE IN HURON, S. D.

On April 8 and 9, the first annual Dakota Aerial Applicators' Short Course and Convention was held in Huron, S. D., sponsored by the South Dakota Aviation Trades Association and associate members.

In attendance were spray operators from North and South Dakota, Montana, Nebraska, Iowa and Minnesota, as well as representatives of chemical companies, insurance companies and aircraft supply houses that are associate members of SDATA.

Among the topics covered were "Aerial Application of Herbicides," by Dr. Lyle Derscheid, Agronomy Dept., S. D. State College; "Aircraft Plastic Engineering," Lewis A. Whinnery, Dakota Aviation Co.; "Areas of Insect Control Anticipated in 1959," Robert J. Walstrom, Entomology-Zoology Dept., S. D. State College.

At the association's business meeting, members elected the following officers to serve for the coming year: President—Walter Ball, Huron; 1st Vice President—Roy Crisman, Wagner; 2nd Vice President—Arnold Kolb, Spearfish; 3rd Vice President—Robert Wiley, Winner; Vice President in Charge of Spray Operations—Duane Sly, Chamberlain; and Secretary-Treasurer—Kathryn Polad, Huron. †

THIS MONTH'S

Meeting Highlights

Chemical Specialties Manufacturers Association 45th Midyear Meeting

Drake Hotel, Chicago, Ill.

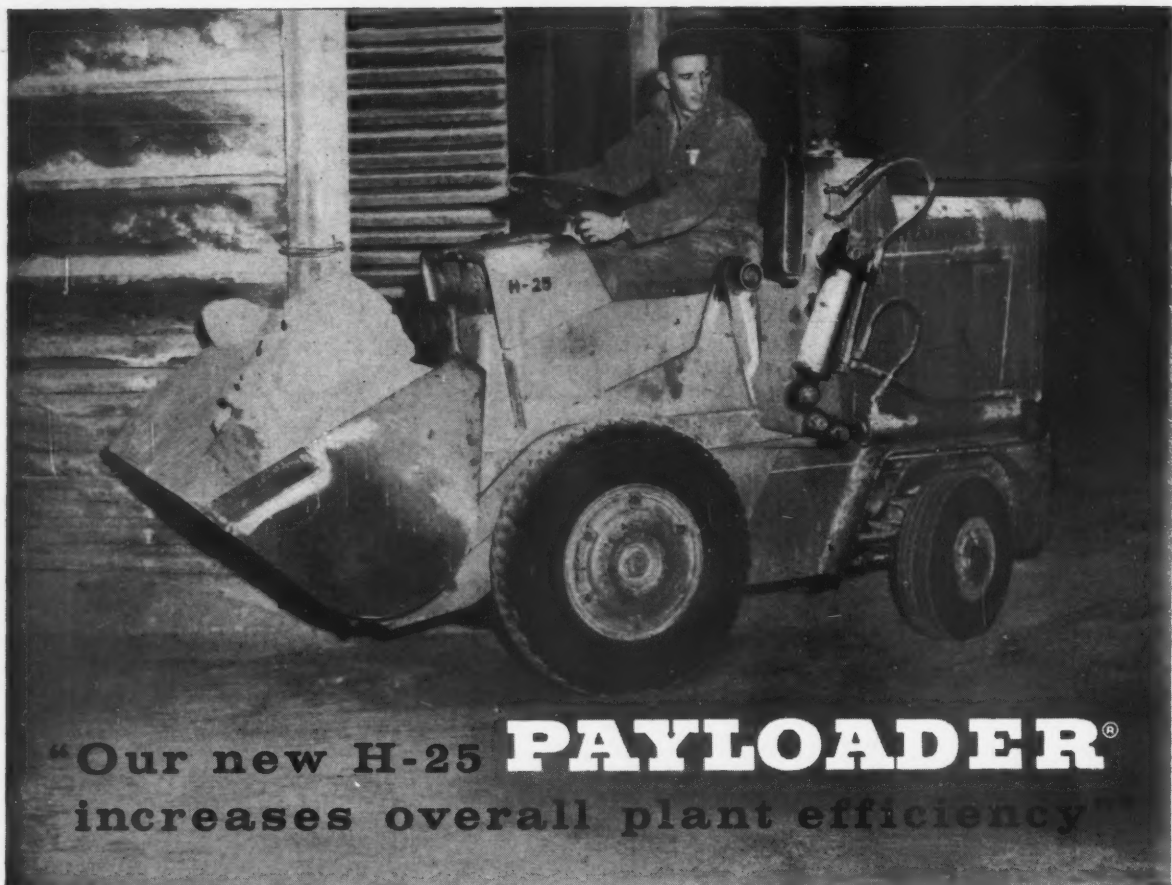
May 18-20. Among the guest speakers will be William C. Stolk, president of the American Can Co.; James Q. duPont of E. I. duPont de Nemours & Co.; James K. Langum of Business Economics, Inc., and Larry LeSueur, CBS news analyst.

The meeting will hear reports from the Association President, Donald M. King of Masury Young Co., Boston; the Treasurer, P. C. Reilly, Reilly Tar & Chemical Corp., Indianapolis, and the Executive Secretary, H. W. Hamilton.

A principal feature of the convention will be technical sessions of CSMA's six divisions, including the Insecticides Div.

Highlight of the Insecticides Session will be a *Symposium on Fly Control*, with Harry L. Haynes, National Carbon Co., division of Union Carbide Co., New York, presiding. Panel: D. E. Powell, Dept. of Entomology, Oklahoma State University; Ellsworth H. Fisher, Entomology Dept., University of Wisconsin; W. C. McDuffie, Agricultural Research Service, Beltsville.

Lawrence B. Hall, U. S. Public Health Service, Savannah, Georgia, will deliver a paper on *Insecticides and Germicides—Tools of Preventive Medicine*, and there will be a special report on the *Industrial and Household Insecticide Survey*.



"Our new H-25 **PAYLOADER**[®]
increases overall plant efficiency"

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That's how Ralph J. Puetz, Plant Supt. of Senesac Fertilizer, Inc., Fowler, Indiana sums up the benefits of the H-25's "larger bucket capacity, power-shift transmission and other operating features". At the same time, he also adds a good word for their 4-year old model HA which "has worked continuously, giving very good service with no repairs except normal maintenance".

If you want to get more production per tractor-shovel and per operator, the Model H-25 "PAYLOADER" merits your consideration.

BUILT FOR PRODUCTION — On several occasions Senesac's Model H-25 has unloaded 50-ton rail cars of bulk material in one hour. With its 2,500 lb. carry capacity — 25 to 50% more than has been heretofore available in a 6-foot-turning radius unit — the H-25 can carry more per trip. Because of its power-steer and power-shift transmission with 2 speed ranges forward and reverse, it handles with finger-tip ease and cycles faster to make more trips. The more-powerful bucket break-out action, and more-positive traction provided by power-transfer differential get big loads easier out of hardened stockpiles.

BUILT-IN PROTECTION — It has extraordinary protection against dust and dirt damage: triple air cleaners — pre-cleaner and two oil-bath air cleaners; cartridge-type oil filters on the three oil systems; sealed self-adjusting hydraulic service brakes; parking brake enclosed in transmission; special oil and grease seals on all vital points.

For bigger loads, for faster, easier operation — for more production per shift at lower net cost per ton, get an H-25 demonstration from your Hough Distributor. Ask him about Hough Purchase and Lease Plans, too.

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WASHINGTON VIEWPOINT

F
C

*Congressional committees consider proposals aimed primarily
▶ at expanding Soil Bank's Conservation Reserve. Overall idea
is to reduce crop production by about 10% from current levels.*

*▶ According to an FDA survey, 33% of the milk supply may contain
pesticide residues. Figure reported five years ago was 62%.*

A big shrink in planted farm acreage is due in the immediate years ahead. This now seems certain as both Agriculture Department officials and leading lawmakers turn to the Soil Bank as the primary program to control surplus production.

Proposals now being considered in Congressional committees are aimed primarily at expanding the Soil Bank's Conservation Reserve. The USDA wants to increase the amount of land retired from the current 23 million acres in the Conservation Reserve, to at least 40 million acres. Top USDA officials believe that to be the maximum they can ask for this year in view of the current budget-balancing campaign. Actually, they believe that a total of 50 million acres retired would be more desirable in point of reducing production.

The USDA plan would emphasize the retirement of entire farms from production, for periods ranging up to 10 years. Under the plan, if approved by Congress, farmers would start signing up in the summer of 1960. Total cost to the government would be increased from next year's estimate of \$342 million to more than \$600 million a year under the expanded program.

Indiana Senator Capehart (R) recently introduced an omnibus bill which may or may not form the pattern for legislation this year. Aspects of it are popular among lawmakers, although USDA has withheld its judgment.

Capehart's bill reflects the general trend toward retiring more acreages. The main feature would add up to 40 million acres to the soil bank, in addition to the 23 million acres now signed up—at an annual land rent of about \$25 per acre. The other major features would (1) freeze crop surpluses held by the government, and (2) start a crash research program within the USDA to develop new uses for farm products, at a cost of \$100 million a year.

The land retirement trend is to be aimed at retiring *productive* acres, not just so-so land. This would tend to cut into the base for fertilizer and pesticide sales. The USDA estimates that planted acreage in 1959 will total about 339 million acres. Under the USDA plan, this would be cut to roughly 320 million acres in 1960. Under the Capehart and other measures, total

acreage would be cut close to 300 million acres—back to the 1909 level. The over-all idea is to reduce crop production by about 10 per cent from current levels.

The next 100 days will tell the farm story in Congress. After devoting more than 5 months of the current session to study and political in-fighting over legislative proposals, Congress is now beginning to take votes on resulting proposals. The farm record will be written in the next 3½ months (adjournment about mid-August).

Only two farm bills have cleared Congress so far this year; neither affecting the farm chemicals industry. At this point, the outlook is for piece-meal farm legislation in 1959—with odds against passage of an over-all omnibus farm bill. Some bills of interest, however, now are on their way through.

The legislative outlook: Direct payment proposals (also called "compensatory," "production" payments) have very little chance of being enacted, although they are getting big play this year.

Cotton—Congress is expected to approve a bill permitting growers with allotments of less than 10 acres to lease them to other growers. The bill covers 1959, 1960 and 1961. Although the bill is too late to permit leasing this year, its effect is to preserve grower allotment history in some cases.

Tobacco—No change in allotments is expected to be made, although odds favor a freeze of price supports at 1958 levels. The idea is to keep rising supports from contributing to a loss of exports markets.

Wheat—While the legislative situation continues confused, odds favor wheat program changes this year to affect 1960 production. Strong indications that this will mean a reduction in the current minimum national allotment of 55 million acres.

Other crops—No major changes in current programs, particularly affecting production, are expected to come out of this Congress. Bill to increase price supports for feed grains will fail.

Benson plan—Official proposals to give the Secretary greater personal freedom in setting price supports and acre allotments have been pigeon-holed.

USDA budget—is likely to be increased somewhat over the official estimate of \$6.5 billion, but not as much as the \$7.3 billion now being spent. Research expenditures will remain at the current year's levels. The

What's Coming Next Month

What makes a farmer buy from one dealer and not another? What part does service play in competition? What effect does a dealer's attitude toward new merchandising techniques have on sales? A wide variety of influential factors vitally affect the fertilizer selling effort. A recent Iowa research study will come into focus when we bring you . . .

■ THE IOWA FERTILIZER DEALER

This is a preliminary report dealing with socio-economic-personal variables that influence fertilizer practices in the great corn state. We think it will prove valuable in giving you clues to more effective selling.

■ SUPER FERTILIZER SALESMAN

Everyone who views a copy of the NPFI Fertilizer Salesmen's Handbook has only one question: "Where can I obtain a copy?" At least one plant food company has encountered this question from so many sources that a new trend may be established. Watch for the story next month.

■ "I'LL THINK IT OVER"

In the same line of thought—salesmanship—we'll bring you the second in our new series on how to sell farm chemicals. This article deals with 14 ways to win definite decisions when the prospect says: "I'll think it over."

■ HERBICIDES—NEW PASTURE "TOOL"

Renovating pastures with herbicides is a relatively new and still mostly experimental practice. This article will cover the current methods used and the extent to which weed killers are successful.

■ SPECIALIZED FERTILIZER EQUIPMENT

Fiberglass tanks . . . "pillow" and "bladder cell" rubberized containers . . . these are examples of specialized equipment and materials which show promise of lower cost and higher anti-corrosive qualities for the mushrooming complete liquid fertilizer industry. This article will give you a complete run-down on new equipment and materials in the field.

... in the new

FARM CHEMICALS

BPA

WASHINGTON VIEWPOINT

USDA's proposal to reduce the Agricultural Conservation Reserve Program (ACP) fund from \$250 million to \$100 million will be ignored.

The farm chemicals industry has an economic stake in the current \$9 billion the government has invested in price-supported surplus farm commodities. While no one yet has attempted to assess the true impact of this investment on the farm chemicals economy—doubtless it has played a strong part in sales, aside from whatever influence price supports and controls in themselves have had. The effect of this investment is felt throughout the national economy, according to recent general studies.

The \$9 billion has been pumped directly into the national economy over the past few years. The government has paid out cash to farmers and others (warehousemen and transportation) in return for commodity collateral. Most of this money was spent immediately by farmers for production and living expenses, and to pay off loans from private lenders. The over-all effect, according to economists, was to stimulate business all along the line from the farm to the city. It created buying power which might otherwise not have existed.

For example, during the 1958 recession, the USDA paid out more than \$3 billion to farmers—which in turn was spent by farmers, and thus pumped directly into a slumping economy. The year before, almost \$4 billion was so channelled into the economy through farm spending.

Big question: How much influence did these payments have in maintaining, and increasing, farmers' spending on fertilizer and pesticides? Would current high levels have been reached without these programs? While there's no effort to defend this tremendous expenditure, it may have more importance to the economy than is generally conceded.

Pesticide residues in milk are considerable, but not as great as some believe, according to the recent survey conducted by the Food & Drug Administration. The survey, made in conjunction with a test of the prevalence of antibiotics in milk, revealed the possibility that 33 per cent of the milk supply—by sensitive total bioassay procedure—contains some residue of pesticide. This includes the range from minute quantities to more than trace levels. Five years ago, the level was reported as 62 per cent. FDA officials say they are encouraged, and plan to continue intensive educational programs to narrow the level further.

The offender apparently is the chlorinated hydrocarbon group, according to the test. "As in the 1955 survey, DDT was the outstanding offender in the current survey," officials said.

The antibiotic survey indicated that 3½ per cent of the milk supply contains traces of penicillin. Progress in eliminating the antibiotic from milk also was noted. Five years ago, a sampling indicated 12 per cent of the milk may have contained penicillin. Three years ago it was down to 6 per cent. Now 3½ per cent. Good progress says FDA.

10 hours' work in an 8-hour shift!

That's the production advantage of the Yale Industrial Tractor Shovel

Here are the features that make the Yale Industrial Tractor Shovel outstanding...

PRECISELY CONTROLLED HORSEPOWER! 72 hp. 6 cylinder engine provides smooth power through matched torque converter and Yale torque transmission (fully automatic). One speed in both directions. Inching control permits delicate close-quarter maneuvering. Extra punch for impact loading. Accelerates to 13 mph. in 5½ seconds.

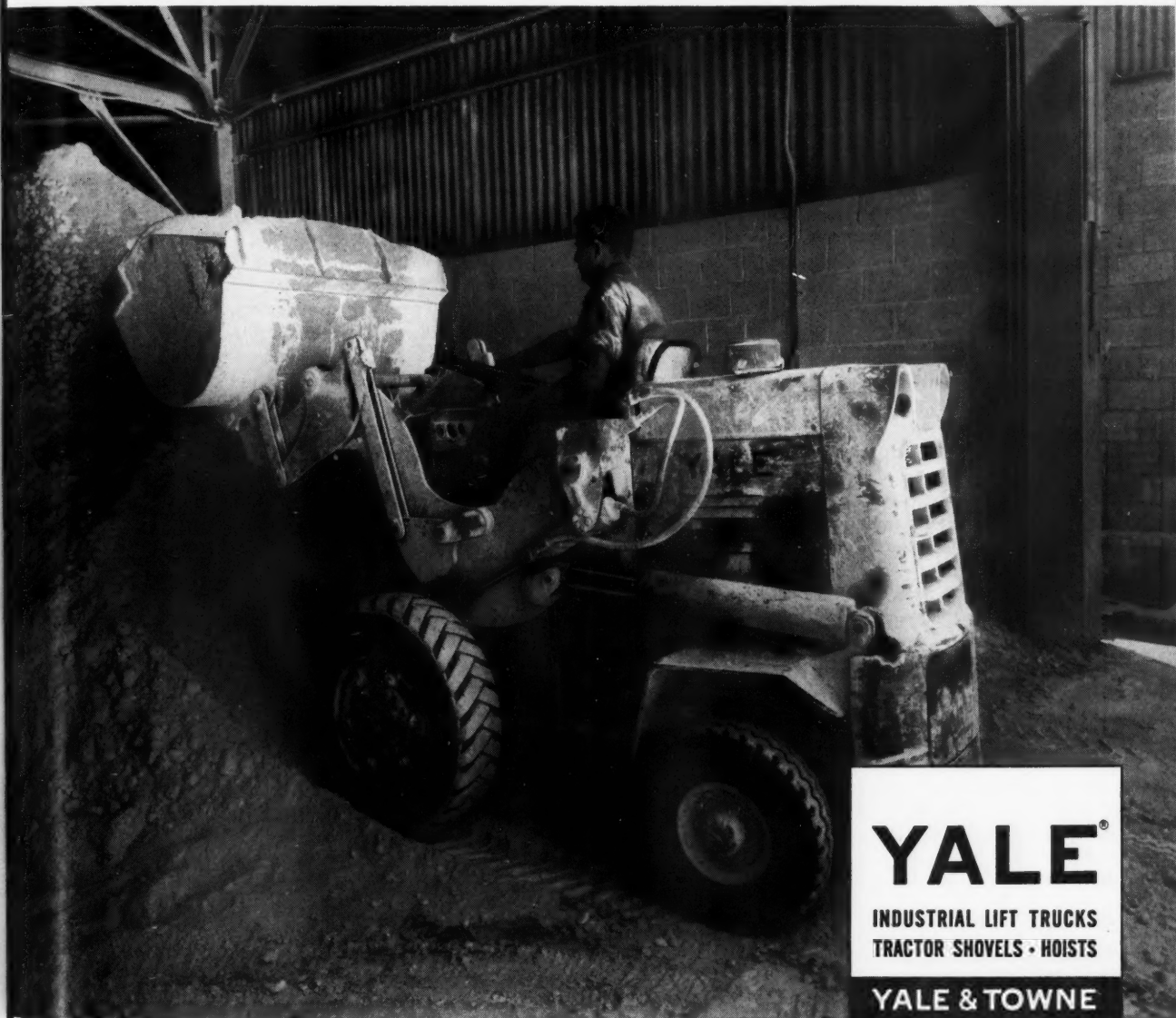
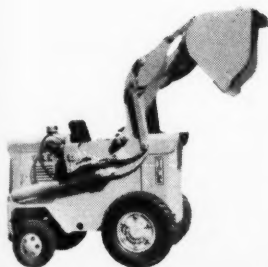
PERFORMANCE! 2500 lb. carry capacity. Exclusive 45° bucket tipback permits faster loading and lowest carry position for faster transport with minimum spillage. 6' dumping clearance permits dumping into bins and hoppers out of range of other—even larger—tractor

shovels. Shortest turning radius, too—only 73".

SAFETY! Safety-curve lifting mechanism members never rise alongside the operator. Front and back working lights provide extra security.

DEPENDABILITY! Rugged design • sealed brakes and electrical system • protected steering linkage • 10 ply tires—all adds up to more work at less cost...more production hours. Full range of buckets and attachments available.

Field applications prove that these features add up to 25% more work per hour—10 hours' work in an 8-hour shift. For a demonstration in your plant or complete information contact your Yale representative. Or write The Yale & Towne Mfg. Co., Yale Materials Handling Division, Phila. 15, Pa., Dept. YT 2-V.



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Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks • Worksavers • Warehouse • Hand Trucks • Industrial Tractor Shovels • Hand, Air and Electric Hoists

How to train your salesmen to create product acceptance is revealed in this, the first of a series of articles on successful salesmanship

Secrets

SHOULD A SALESMAN present his strongest argument first—or save it for the close? When, if ever, should a prospect's fears be built into reasons for buying? Should a salesman ever admit a negative fact about his product? Does it really help—or hurt—to get the buyer “into the act?”

Some startling answers to these, and other questions about persuasion have emerged from the Psychology Department of Yale University, where a group of social scientists, working under a grant from the Rockefeller Foundation, recently scrutinized the effects of different tactics on buyer psychology.

For the salesman, the results of the Yale experiments offer a gold mine of selling know-how. Reached under laboratory conditions, they are neither colored by personal opinion nor slanted by individual experience. They are tested, measured, proven.

CAN YOU AFFORD TO GIVE BOTH SIDES OF YOUR STORY?

Many salesmen, committed to the power-of-positive-thinking approach, argue that bringing up negative points about their product in a presentation is the sure death of a sale. “Talk yes, get yes,” they contend.

Here's news from Yale:

Experiments prove that with at least three types of customers, you will stand a better chance of closing a sale by deliberately bringing up the negative points about your offer, as well as the positive. Which types of prospect? 1) The educated one; 2) the prospect who disagrees with you at the very outset; 3) the prospect who is exposed to subsequent arguments against your product from competitive salesmen.

On the other hand, exactly the opposite strategy will work for you when 1) the prospect is uneducated; or 2) agrees right off with your viewpoint; or 3) is not likely to be solicited by competitive salesmen. In their cases, the studies show, it's best to stay strictly positive.

In a nutshell: if you are selling in a highly com-

petitive field, where the prospect is likely to be approached by other salesmen competing for his business, you can largely neutralize their arguments by anticipating—and answering—they in advance.

In effect, you arm the prospect with reasons for ignoring or discounting the arguments he will hear against your product. Thus “innoculated,” he will tend to retain the positive conclusions you have planted in him; in fact, he is likely to take pleasure in resisting your competitors with reasons he has already accepted as convincing. The result: a sale.

WHEN TO ADMIT LIMITATIONS

Two groups of people were exposed to identical presentations on the rewards and drawbacks of a common household product—with one small difference. The first group was informed of the rewards of owning the product, then told of the drawbacks. This order was reversed with the second group. Several weeks later, both groups of individuals were questioned. The first group had bought almost twice as much of the product as the second group.

Psychologists call this the “primacy effect.” That is, what a prospect hears first lingers with him longest. If you list the benefits of a product or service before the drawbacks, you create a “that's-for-me” state of mind. Start with the drawbacks and you create a “no-thanks” attitude.

IS IT SAFE TO LET THE PROSPECT DRAW HIS OWN CONCLUSIONS?

The Yale group discovered that the answer to this question depends on two factors:

- ▶ Does your proposition involve the prospect personally—or impersonally?
- ▶ Is your proposition a simple one—or complex?

Thus, when the prospect is highly educated or intimately familiar with the subject, it is unnecessary



The author, Ted Pollock, is contributing editor of THE AMERICAN SALESMAN and also writes on sales and salesmanship for many leading publications. During 1958, he questioned more than 400 sales managers in an editorial survey of his own. Object: to determine at first hand the subjects most directly and deeply interesting to salesmen and their bosses.

This article, and the others in the series to appear in future months, are results of this “straight from the horse's mouth” poll.

PERSUASION

By TED POLLOCK

to spell out the conclusion for him. In fact, he is apt to be insulted by your presumption in "drawing diagrams." An insurance salesman, for example, need not map for a banker the major advantages of creating an immediate estate; he may very well have to itemize them for a laborer. An encyclopedia salesman doesn't have to go into the same kind of details with college graduates as he may with high school graduates.

When the product or service is an "ego-involving" one (automobile, home, furniture, jewelry, clothing, rent-a-car), the potential customer is strongly motivated to make up his own mind. When the product is an impersonal one, however (raw materials, business systems, machinery), the prospect tends to welcome conclusion-drawing by the salesman.

Complexity is another factor. If the benefits of a product are obvious, emphasis on them by the salesman makes little difference. On the other hand, if they are involved (hidden tax benefits, for example) and the steps leading from the premises to the desired conclusion are not immediately obvious, the salesman should spell out in detail the benefits he is offering.

FEAR—YOUR FRIEND OR FOE?

► "You won't be popular unless you use our product."

► "You wouldn't want to leave your family in want, would you?"

► "You're losing money by not carrying our line."

Much effective selling is based on a threat, hidden or obvious. But just how powerful a selling tool is the old-fashioned scare? What are its limitations?

While much work remains to be done in this area, a good deal is already known about the efficacy of threat appeals in selling.

The Yale group found, for example, that three things occur when a prospect is exposed to a threat appeal. He thinks, "This might happen to me." He grows tense. And his tension is reduced as he listens to the salesman explain how to avert the threat. Most important, this reduction of tension operates as a *reinforcement* of the salesman's recommendations.

However, there are three built-in pitfalls in the threat approach.

► Each of us is equipped with a kind of unconscious blackout system. When we experience something too oppressive for comfort, we drop a curtain over it. Therefore, if the salesman creates *too* much anxiety,

the prospect simply tunes him out—he stops taking seriously what he hears.

► Sometimes, when the threat creates more anxiety than we can tolerate, we react with aggression toward the source of the threat. In selling, this can take the form of a prospect rejecting or refusing to believe the salesman's statements.

► If the threat is more than we can handle, we sometimes develop a psychological defense against it. Scare a prospect too much and he may unconsciously pull a blank when he later tries to recall what you said . . . or lose interest in the subject altogether . . . or deny to himself the importance of the threat. In any case, he remains unsold.

In short, the threat is a powerful selling tool—up to a point. Past that point, it ceases to sell at all; it simply paralyzes. The word: moderation.

SHOULD YOUR PROSPECT "GET INTO THE ACT?"

Yale's answer, corroborating the experience of most salesmen: an unqualified "Yes!"

But what if the salesman is selling an intangible—or a product with long-range benefits? It's obviously one thing to get a prospect to test-drive a car or hammer a piece of unbreakable glass or use a tool. How, though, can you get the potential customer for a piece of real estate or an insurance policy "into the act"?

There is a way—powerful, convincing, practically sure-fire.

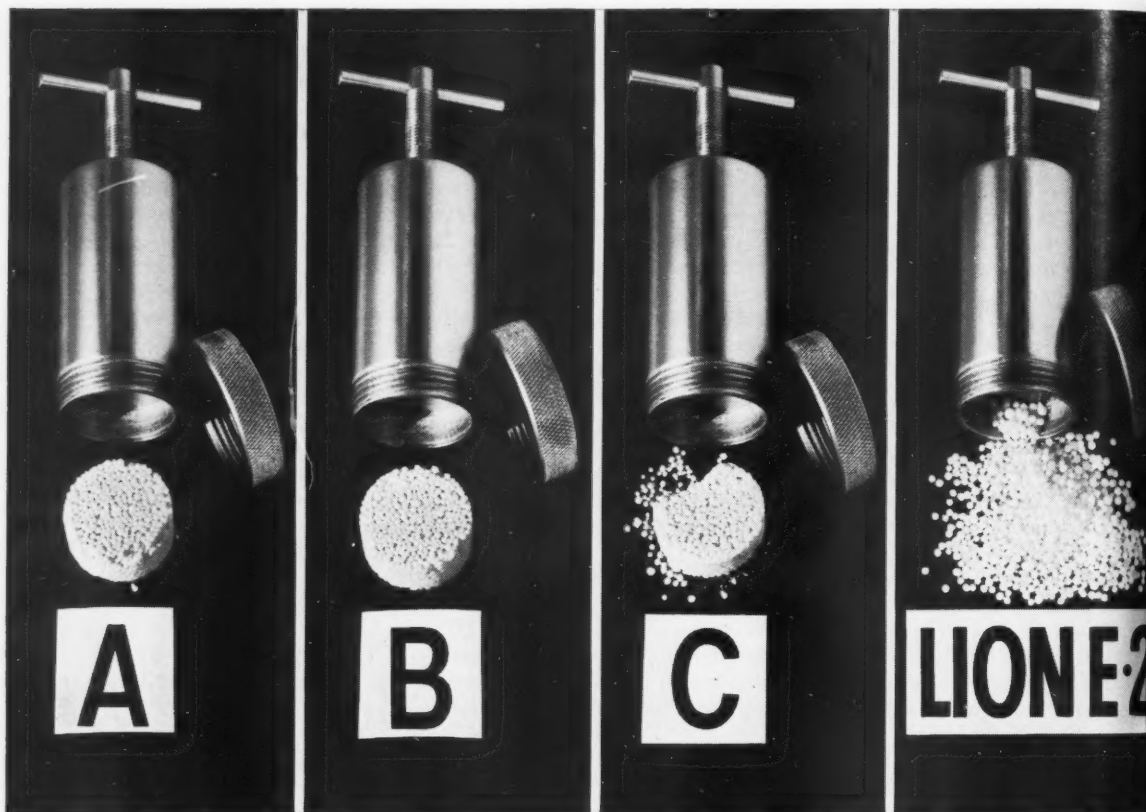
It's called "verbal conformity." Put simply, the Yale scientists discovered that "saying is believing." Get a prospect to repeat all—or a part—of your presentation in his own words *and the simple act of saying will influence his private convictions*. Several methods for achieving this "verbal conformity" suggest themselves. A salesman might ask the prospect to explain the product or proposition to his wife, partner or colleague. He might suggest the prospect dictate a memo on the subject. He might even purposely grope for words, allowing the prospect to fill them in. The point is—get the prospect talking.

There are three vital advantages to this technique: the prospect invariably puts the message in his own words, thus picturing more clearly in his own mind the benefit images you are trying to create. The words he chooses are those that have the most emotionally loaded meanings for him (something no

(Continued on page 22)

***It's a fact: Monsanto's new fertilizer discovery
acts like "profit insurance" for you***

ONLY NEW LION E-2* ENDS CA



COMPRESSION CHAMBER TESTS PROVE NO OTHER AMMONIUM NITRATE CAN MATCH NEW LION E-2 FOR NO-CAKE, DUST-FREE PERFORMANCE

No more customer complaints, costly returns, double handling or extra bookkeeping when you sell new Lion E-2 no-cake ammonium nitrate fertilizer. Here's the whole profit story.

New Lion E-2 is the first truly non-caking ammonium nitrate. Lion E-2 was developed by Monsanto scientists seeking to end one of the major problems plaguing you and your customers: fertilizer caking. Tested in the field under all extremes of temperature and humidity, Lion E-2 just wouldn't cake.

New Lion E-2 won't gum up, clog or bridge in your customer's spreader. The uniform prills are 50% harder... free of irritating dust and fines. They won't break

down, crumble or cake either in shipment or storage.

New Lion E-2 takes 20% less of your storage space because it's super-dense. It has the greatest density of any ammonium nitrate made today. Lion E-2 saves your time, storage space, and makes your handling job easier.

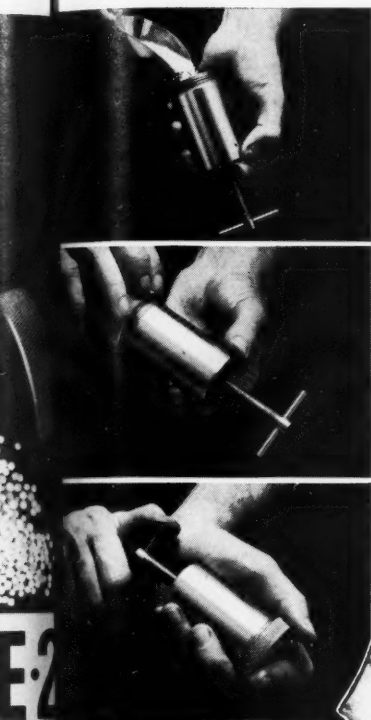
New Lion E-2 lengthens your selling season because it's storage-stable. It is not readily affected by temperature changes or humidity. Your

customers can buy any time and store safely until used. LION E-2 may well prove your big year-round volume builder!

Lion E-2 is guaranteed not to cake in the bag in your place or on your customers' farms. From all angles, Lion E-2 is the superior-quality ammonium nitrate... yet it sells at the same price as ordinary ammonium nitrate. Sell your customers the best and you'll keep old customers coming back and gain many more new customers who want the best: new Lion E-2.

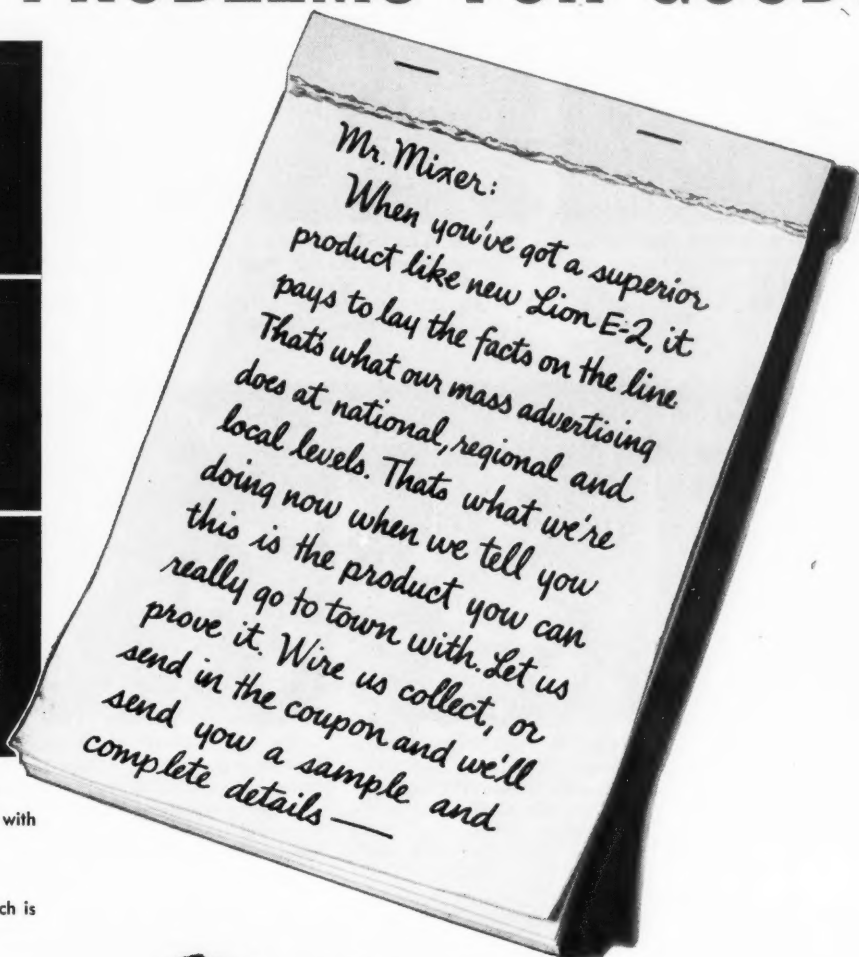
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MERCHANDISING AIDS

PROMOTION

1. Create believability . . .



GEORGE, INEXPERIENCED plant food salesman, calls on farmer Quigle and says, "I stopped by to talk with you about buying fertilizer."

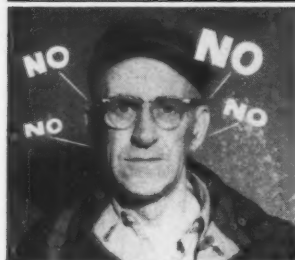


"NOT INTERESTED," says Mr. Quigle. "My neighbor's a fertilizer dealer and he gives me a good price so I'm satisfied. Besides, fertilizer is fertilizer so I wouldn't be interested in changing brands."

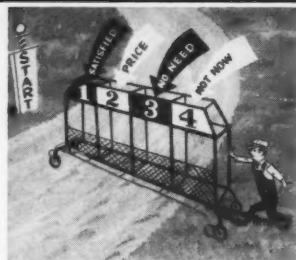


NOT KNOWING how to handle the situation, George stammers and mutters, "Well, if you ever change your mind . . ." and leaves.

3. Show how to overcome objections . . .



"THE TROUBLE with most salesmen," says Carl, "is that they believe the first 'NO' they get is an objection when, in reality, this 'NO' is an excuse . . . an alibi."



"THE FARMER PUSHES a barrier of excuses and alibis across the track at the beginning of the sale hoping you won't know how to get rid of it . . . and most salesmen don't know how."



"IT'S WHAT YOU SAY at the beginning that counts. When I introduce myself, I tell the prospect what my soil fertility plan will do for him . . . in terms of his buying motives."



"MR. SLOCUM, I'm Carl Swartz of the Ace Hi Plant Food Co. I'm calling on you to discuss how we can help you reduce costs, improve yields, ease your work and grow crops that will be the envy of the neighborhood."

Filmstrip trains salesmen—UPSA

FILMSTRIPS can be used effectively in 1) sales clinics and 2) actually selling farm chemicals. They came into prominence during World War II when great emphasis was placed on this type of projected picture in civilian and military programs.

Ralph Everett of Empire Sales Training, Miami, Fla., consented to making up a short "script" for FARM CHEMICALS to show you how effective this sort of message can be in farm chemicals sales training.

Try to imagine the sound effects used in his presentation, "4 Steps to Profitable Plant Food Sales," which has been used by leading plant food companies. Sound effects—such as mood music and other "trap-pings"—are essential for over-all acceptance.

Everett produced this filmstrip for his "Fistful of Future" sales clinics and since then has been in constant demand across this country and Canada. It was the highlight of the recent pilot Fertilizer Salesmen's School, sponsored by the National Plant Food Institute, in Columbus.

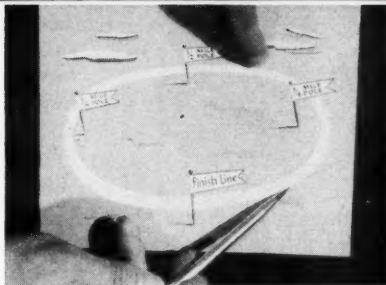
Note how his short script brings out the 4 steps: 1) determine the prospect's problems and learn his buying motives, 2) sell a mental concept of what your soil fertility plan can do for him, 3) answer his objections and 4) ask for the order and close the sale.

Visual materials have great communications value, but are only as good as they are used! Don't fail to 1) have a soundly planned introduction (Run it

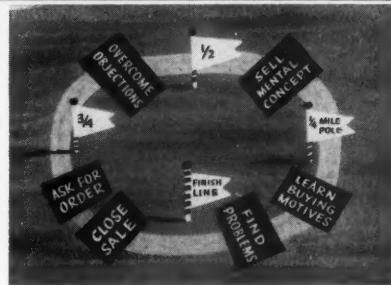
2. Appeal to emotions . . .



CARL, THE EXPERIENCED and successful plant food salesman, listens, back at the office, as George explains his predicament.



"SELLING IS LIKE A RACETRACK," Carl says, "divided into four separate steps. Keep this picture in your mind and you'll always know where you are in every step of the sale."

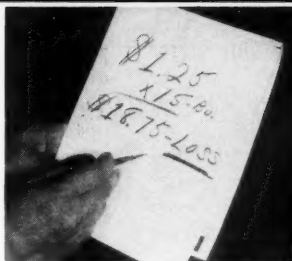


"IN STEP 1 you find out the prospect's crop raising problems and learn his buying motives. 2: Sell a mental concept of what your soil fertility plan can do for him. 3: Answer his objections, and 4: Ask for the order and close the sale."

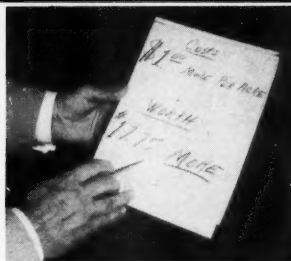
4. Show how to develop desire . . .



"BEFORE I make my call, I do some advance planning, to tailor my sales presentation to fit the farmer I'm seeing. I use every sales tool I have available. People learn ten times faster with pictures and believe what they see far more readily than what they hear."



"HELPING THE PROSPECT figure helps too." For example, "If corn is \$1.25 a bushel and you lose 15 bushels through poor plant population, that means \$18.75 loss."



THE PLAN I'm recommending for you is to use a quarter ton more plant food per acre . . . only \$1 more per acre. On this basis, you could pay \$17.75 more per ton and still be ahead by preventing plant population loss.



"SAMPLE DEMONSTRATIONS are good, too," says Carl. "See how our granular plant food with a minimum of fines saves you money and time. You can use it in windy weather and it won't blow away."

Plant farm chemical sales

through several times before the meeting), and 2) follow up effectively to show how this applies to your program. ▲



Ralph Everett established Empire Sales Training in 1951, following a 10-year career as salesman and sales-trainer for Ralston-Purina Company. He saw the need for selling a soil fertility plan, rather than selling a product on a price per ton basis. Since then he has staged clinics for three leading plant food companies.

MAY, 1959

19



"NOW", Carl says, "I can begin to draw the picture in his mind of how much easier his work will be and how much pride he can take in his better crops."



"AND I CAN VISUALIZE for him how the increased yields at lower costs will get him whatever it is he wants most."

GEORGE MAKES THE SALE. He finally learns how to find buying motives, visualize what his plan will do for the prospect, and gets the order.



Dr. Arthur Bing talks to a group of growers at a methods demonstration. Author Lutz is second from left.



sell chemical weed control

By PAUL A. LUTZ

CHEMICAL weed control in gladiolus fields in Schenectady Co., N. Y., in 1959 will be the rule rather than the exception. Although no commercial growers used chemicals to control weeds during the summer of 1957, 75 per cent of them did use chemicals during the summer of 1958. And, based on a poll made at our winter flower growers' meeting held recently, it will approach 100 per cent in 1959.

How could such a rapid and thorough change be brought about? Only by close cooperation from specialists, growers, and the county agent.

During my first year (1956) as assistant county agricultural agent in Schenectady county, New York, a representative of the area Florists Club requested that I attempt to engage Dr. Arthur Bing, of the Cornell Ornamentals Research Laboratory, at Farmingdale, N. Y., to talk on chemical weed control at one of their meetings. Dr. Bing had been conducting research trials with various chemicals to determine their effect on gladioli for some time.

Dr. Bing accepted this invitation and as a result a chemical weed control program, not only for florist crops, but vegetables and home grounds as well, was born in Schenectady county.

Since a lot of information was needed before the program could begin, I attended a meeting at Farmingdale at the invitation of Dr. Bing to plan result demonstrations to be established in 1957. Several chemicals were included in the plans for these demonstrations. Dr. Bing also demon-

Editor's Note—*The County Agent Award, presented each year at the Northeastern Weed Control Conference, went this year to Paul A. Lutz, Schenectady county, N. Y. Lutz has conducted outstanding chemical weed control demonstrations for the past two years. And through his efforts, the use of chemical herbicides has become common practice among farmers and horticulturists in that county. Following is Paul A. Lutz's own story of his weed control winning program.*

strated his equipment for applying these chemicals and how to calibrate them.

Shortly after this meeting, a service letter was sent, informing the growers about the savings that could be realized by using chemicals instead of labor to control weeds.

This letter was followed up by personal visits to gladioli growers to discuss chemical weed control. These visits helped me select co-operators for the result demonstrations. I wanted growers who were genuinely interested in this project and would follow it through to completion.

Although the interest was high, most growers seemed to prefer that the demonstrations be located at someone else's field.

WEED KILLERS DISTRUSTED

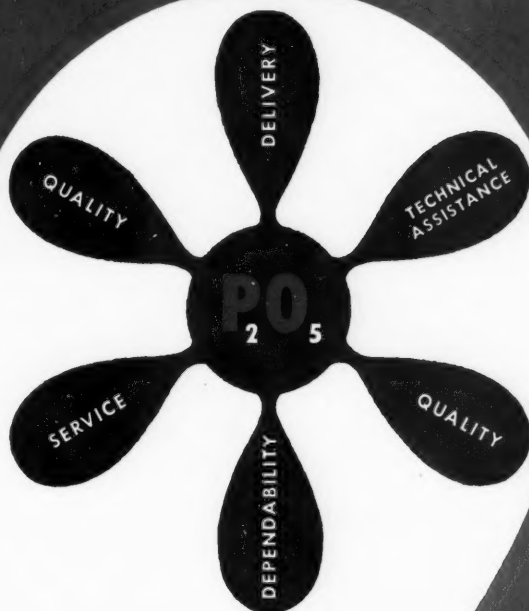
This reluctance to chemical weed killers among the growers was caused by some unfortunate experiences which had occurred in the area previously, and because of cautions which had been emphasized with earlier chemicals.

However, two growers who met the above qualifications, finally agreed to set aside part of their fields for the demonstrations. Our program was underway. One field was under irrigation and one was not. Five chemicals were used at two different rates and each plot was replicated twice. Including two check plots, this totalled 22 plots in all.

Fortunately, the results at both of these fields were excellent. A meeting was held at both locations six weeks after application. The growers who attended were very much impressed. Dr. Bing attended



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to crow about...



DAVISON Hi-Flo Gran-U-Lated Triple Superphosphate is unexcelled by any other

✻ $(S_1Q_2D_2TA_1)$ The Davison formula of properly proportioned parts of Service, Quality, Dependability, Delivery and Technical Assistance ($S_1Q_2D_2TA_1$) is as important to you in your choice of source as anything else we could name.

In every field, there is always one particular brand that is so outstanding that it is head and shoulders above the competition. That is true of Davison Hi-Flo Gran-U-Lated Triple Superphosphate. Here is the product that is the standard of comparison for all other granulated triples. Davison Gran-U-Lated Triple Superphosphate is uniform in particle size . . . dust free and will not break down or crumble in the bag. It is ideal for direct application or for formulation of dry materials. Most of all, with Davison Gran-U-Lated you are certain of constant uniformity . . . it is GUARANTEED 46% available P_2O_5 . . . every time.

A test carload will prove it to you. Simply call us today. The Davison Sales and Technical Representative will be happy to provide complete information.



W.R. GRACE & CO.

DAVISON CHEMICAL DIVISION

Baltimore 3, Md.

DEMONSTRATIONS

(Continued from page 20)

these meetings also, to answer growers' questions. Colored slides were taken and shown at later meetings. Black and white pictures were also taken to be used in newspaper and magazine articles.

Photographs were taken at digging time to show that there was no damage to the corms, and that there were fewer weeds in the treated areas which expedited corm harvesting.

Later in the fall, arrangements were made with Dr. Bing to conduct methods demonstration at a local nursery which was having a chick-weed and annual bluegrass problem. Florists and vegetable growers, as well as nurserymen, were invited to this meeting as the method of calibrating their equipment and application would be the same. Colored slides from the result demonstrations of the previous summer were shown to those attending to again emphasize the results of using weed killers.

Knowing Dr. Bing would be there, arrangements were made for a 10 minute radio program prior to the method demonstration. Dr. Bing, the two gladioli growers who had had the result demonstrations that summer, and I discussed the advantages of chemical weed killers on the program.

For the 1958 season, granular chemicals were made available to us for extensive use. Early reports indicated that they were not only easier to apply, but had a longer residual effect. Therefore, arrangements were made for another result demonstration in 1958 to compare liquid and granular forms. Meetings were held at these demonstration plots also.

EQUIPMENT MADE AVAILABLE

The growers were informed that anyone who wished to use our equipment to apply these chemicals on their own field could do so. Several growers accepted this offer. When the equipment was delivered

to them, each one was shown how to use it.

OUTSTANDING RESULTS

As a result, 90 per cent of the gladioli growers who had attended our meetings during the summer of 1957, used chemical weed control on their fields during 1958.

I believe that there were two reasons for the success of this program.

The first reason was the excellent cooperation received from both specialists and growers. Without this cooperation, it undoubtedly would have taken a much longer period of time to bring about this change.

The second reason was the order in which the events occurred. By informing growers of savings involved—through the service letter and personal visits—interest was aroused. Then, showing them results created the desire to use this practice. And finally, showing them how to apply the chemicals, gave them the confidence to proceed. ▲

SECRETS OF PERSUASION

(Continued from page 15)

salesman can ever know for sure). And by encouraging him to put it in his own terms, the salesman boosts the odds that at a later date some reinforcing situation will occur to remind the prospect of the presentation.

For instance, suppose insurance agent Smith doesn't know that prospect Jones would like to assure a substantial donation to his alma mater. By permitting Jones to put the benefits of increased insurance into his own words, Smith may get Jones to say to Mrs. Jones, "This extra insurance would be a wonderful way to do something for the university." Having said that, days after Smith has departed, Jones will think of the increased insurance whenever he receives literature from his school, drops in at his University Club or discusses college life with friends. They represent "reinforcing" situations.

A word of caution: make very sure that the prospect understands your message before he puts it into his

own words, for the Yale experiments indicate that if he bungles his "performance" he grows dissatisfied with himself—and transfers to the message his inadequacy in explaining it. If his performance satisfies him, the message tends to satisfy—and persuade.

DOES REPETITION PAY OFF?

Only up to a certain point. A message—any message—is remembered better if it's heard twice instead of once, three times instead of twice, four times instead of three times. But, according to the results of intensive experiments, there is little improvement in the prospect's retention of your sales story after the fourth repetition.

Lesson: if you haven't sold after the fourth approach, lay off for a while. Then go back and start over.

DIFFERENT PROSPECTS, DIFFERENT TACTICS

Persons low in self-esteem and self-confidence tend to be the most easily persuaded. These unconsciously seek the approval of others whom they automatically accept as superior to themselves.

And who is the prospect with the greatest sales resistance? The "nervous," neurotic, habitually suspicious person.

Further, say the researchers, persons of high intelligence or good education tend to be swayed less easily by emotional appeals than by impressive logic supported by acceptable proofs.

People of low intelligence respond more readily to emotional selling, are less critical, less easily moved by logical arguments. ▲

TWELVE WORDS THAT TRIGGER ACTION

TV and radio advertisers invest millions in "commercials" that must pack persuasion into every precious moment. Here are 12 of the most persuasive "selling" words as discovered by expert research.

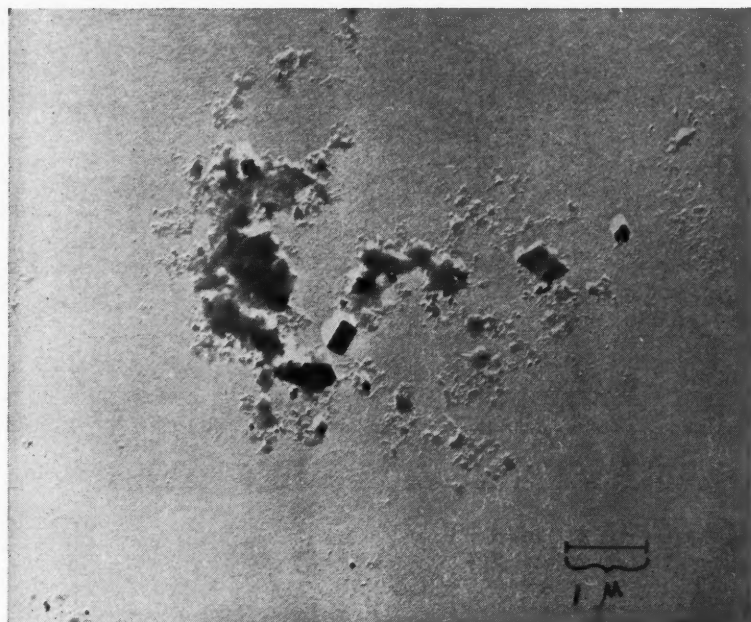
you	easy
money	safety
save	love
new	discovery
results	proven
health	guarantee

for best uniform results

use **TAKO** with confidence

(the natural colloidal kaolinitic kaolin)

TECHNICAL FACTUAL INFORMATION THROUGH RESEARCH



Electronphotomicrograph, TAKO

Magnification 4 (Negative, 5100 diameters; print, 15,000 diameters). On the print, 1mm corresponds to 0.067 microns. Distinct rectangular forms are observed in the range from 0.07 to 0.4 microns in length. Less definite evidence is seen for particles of still smaller size.

"TAKO" Airfloated Colloidal Kaolinitic Kaolin is a natural practically chemically pure inert colloid with exceptional qualities. It excels as a diluent-carrier in formulations of insecticides-pesticides and as a prilling and coating agent in the production of high analysis fertilizers. It gives increased workability-dispersion. Its purity is highly desirable due to its compatibility with chemicals. Its colloids give increased adhesive-adsorptive properties.

"TAKO" used in large tonnage for years most successfully and economically as a diluent-carrier in the formulation of insecticides-pesticides and as a prilling and coating agent in the production of high analysis fertilizers.

"TAKO"—This Natural Very Pure Colloidal Kaolinitic Kaolin is produced from our Company-owned mines, processed under straight-line production with the very latest electric controlled automatic equipment—resulting in our very low per ton established price for this high quality colloidal product.

NON-ABRASIVE • NON-HYGROSCOPIC • NON-CAKING • FREE-FLOWING

"TAKO" Is Produced Under Laboratory Control—ALWAYS UNIFORM IN QUALITY
IT WILL PAY TO INVESTIGATE "TAKO" FOR YOUR REQUIREMENTS

THE THOMAS ALABAMA KAOLIN COMPANY

2412 KEN OAK ROAD, BALTIMORE 9, MARYLAND, U. S. A.
Mines, Plants & Shipping Point—Hackleburg, Alabama

pH Value 4.4
Bulk Density—lbs. cu. ft.
Loose—Approx. 20 lbs.
Packed—41 "
Porosity 130%
Specific Surface—(CM²-22,700)
Particle Type—Crystal Flat
Rectangular Plates and
Crystal Aggregates
Specific Gravity—2.62
Particle Size Distribution—
Sedimentation, using
Andraesen Pipette Procedure

SIZE (Microns)	EQUAL or FINER %	GROUP %
.5		54.0
.5	54.0	
1.0	64.0	10.0
2.0	75.6	11.6
3.0	81.9	6.3
4.0	85.5	3.6
5.0	87.6	2.1
6.0	89.9	2.3
7.0	91.8	1.9
8.0	92.7	0.9
9.0	93.8	1.1
10.0	94.3	.5
10.0		5.7

**ABSOLUTELY
NO MICA**

**GUARANTEED LESS 1%
FREE MOISTURE**

MATERIALS HANDLING CUSTOM APPLICATION

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When material is discharged from a bulk-hopper car into any standard type of conveyor system it is fed into Tote Bins. Tote Jolter is sometimes used to assure complete filling. This

mechanical device sends material into Tote Bins in a series of jolts. Handling of the bin—from filling through checking and weighing to warehousing—takes only several minutes.

Handling farm chemicals with THE TOTE SYSTEM

ONE OF THE FASTEST GROWING TECHNIQUES in bulk materials handling is the use of portable unit containers. Containers can be fabricated of various materials and their capacities will normally vary from 3000 to 10,000 pounds.

The containers, along with the automatic accessory equipment for filling, transporting, and discharging, are adaptable for inter-plant shipments or for solving in-plant handling problems. The efficiency in handling is comparable to large, fixed bulk storage, and they have the advantage in most cases of lower cost, simplification of conveying equipment, flexibility, and better product protection.

Containers, in this discussion, will be limited to units adaptable for bulk handling dry materials such as all types of chemical and plastic resins. They are applicable to two general types of operation—inter-plant shipment by truck, rail or barge, and for the solving of in-plant handling problems.

Our discussion will primarily be based on the Tote System, which was the first to be introduced on a nationwide basis, and by far the most widely used system of portable containers.

The heart of the Tote System is the Tote Bin which is fabricated from either aluminum, steel, magnesium or stainless steel.

About 90 per cent of all the tens of thousands of Bins now in service are fabricated from a high-strength aluminum alloy, which has the advantages of light weight, compatibility with nearly all dry materials, and durability with the minimum amount of maintenance.

In nearly all cases the Tote Bins are fabricated with a base dimension of 42" x 48", which ties in well with standard lift truck equipment and is best adapted for shipments by truck or rail. The 42" dimension permits carrying Bins on trucks two-wide the 42" way, and on rail shipments the Bins are carried two-wide the 48" way.

The capacity of the Bin is varied by changing the height of the sidewall sheet. The majority of the Bins in service will vary in height from 5'9" to 8'3",

* Divisional sales manager, Tote System, Inc. Excerpts of a paper, "Containerization in Bulk Materials Handling," delivered at the 1959 semi-annual meeting of the American Society of Mechanical Engineers in St. Louis, Mo., June 17.

with capacities of from 74 cu. ft. to 110 cu. ft. Depending on the product being handled, the loads handled will vary from 3000 pounds to 5000 pounds.

Bins of this size, fabricated from aluminum, will vary in weight from 225 to 285 pounds. Bins of each size are tareweighted to an even weight to simplify checking the net weight of product handled.

The standard Bins are fabricated with 4-½" drawn legs on each of the four corners, which permits handling with pallet-type lift trucks or any type of fork truck. The Bins are equipped with a filling opening in the top, usually 9" in diameter, and a large discharge door across the bottom of one side of the Bin. The air-tight design of the Tote Bin permits either inside or outside storage. The Bins are also adaptable for high-piling to reduce warehouse storage space requirements.

FIRST OPERATION: FILLING THE BIN

The first operation involved in the use of the Tote System is the filling of the Bin and a number of different types of equipment and techniques are used in this operation. Where it is desired to pack a light weight aerated product, automatic packing equipment can be used, consisting of a jolter and a spinner.

A spinner unit is lowered into the top opening of the Bin and, by feeding product onto a fast traveling disk, the product is thrown to the sidewalls of the Bin, eliminating the angle of repose in the top corners. The spinner unit also contains an air filter unit to exhaust air as the Bin is being filled.

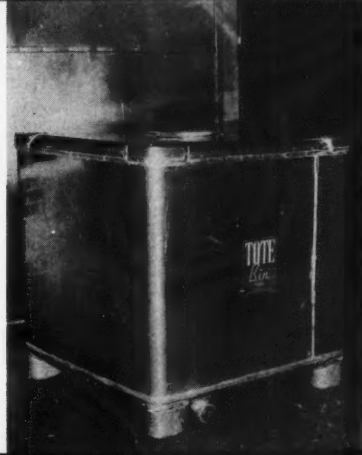
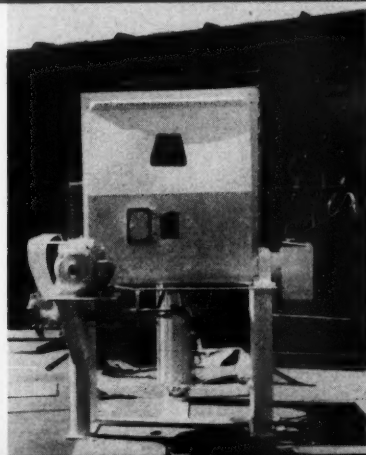
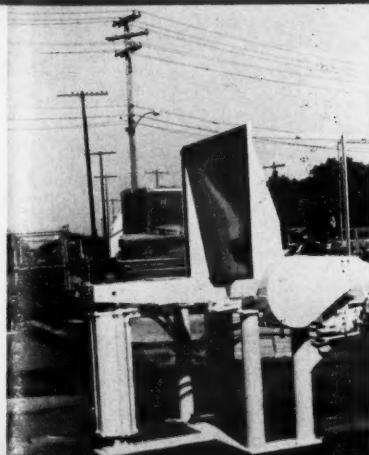
In conjunction with the spinner, the Bin is packed by means of a mechanical or pneumatic jolter. The jolter raises the Bins a varying height, up to ½", at a frequency of approximately 28 RPM. When the Bin is filled, the spinner disc wipes in product and a sensitive overload relay automatically stops the whole packing operation, or diverts it to another packing station in a dual installation.

The use of this equipment in loading products . . . increases the payload carried in each Bin by from 15 to 30 per cent.

In many cases the extra payload is not critical and more simple spouting techniques are used. Frequently, a Y-spout is used on a two-Bin filling station. After

The SA-74 Tote Tilt with motor drive and air cylinder assembly mounted on stand.

Liquid Tote Bin.



MATERIALS HANDLING CUSTOM APPLICATION

the first Bin in the station has been filled, material is automatically diverted to the second Bin while an operator is removing the first Bin and replacing it with an empty.

In some installations of this type, Bins are filled at a rate of from 20 to 25 Bins per hour, which is the equivalent of nearly a carload of material per hour.

Where it is not practicable to fill the Bins at a fast rate, another technique is available which eliminates the necessity of an operator's standing by while the Bins are being filled. In this type of operation, a distribution screw conveyor is located over the top of a line of Bins.

As the first Bin in line is filled, the conveyor automatically carries material to the second Bin and so forth, down the line. Periodically, an operator will remove the loaded Bins and replace them with empty Bins, again keeping the handling man hours down comparable to a fixed storage bin installation. With the multiple Tote Bin filling arrangement, various types of dust-tight connections are available between the filling conveyor and the Tote Bin, including the necessary filters.

NEXT STEP: SHIPMENT OF BINS

The next step in the Tote operation is the shipment. As mentioned previously, Tote Bins can be easily shipped on standard truck equipment—either flatbed or van trailers. In other words, bulk truck shipments can be made without procuring special, expensive, single-purpose trailer units. Up to 16 Bins can be carried on a 33' van, but normally 8 to 12 loaded Bins is all that can be handled due to state highway weight restrictions.

In working out the economics of a truck movement, it is necessary to figure on the roundtrip cost since the empty Bins must be deadheaded, as is the case with gasoline tank trailers, or other special bulk hopper trucks.

On rail shipments, Container Cars are available that permit shipping material in Tote Bins without paying any freight cost on the weight of the Bins when loaded with product or when being deadheaded empty.

The first Container Cars available were privately leased cars by the customers, and the railroads pay a mileage allowance for the use of the cars both loaded and empty.

At the present time the mileage allowance is 4¢ per mile, and the rental cost of the car is approximately \$135 per month. This means that if a customer's car travels a total of 3400 loaded and empty miles per month, the lease cost of the car will be offset by the mileage allowance.

The latest development regarding Container Cars is that they are now being furnished by the railroads. At the present time the railroads are furnishing the Container Cars and the customers are furnishing the Bins for the operation. Naturally, no mileage allowance is paid in this type of operation, but it eliminates the necessity of the customer furnishing the railroad equipment.

Since the economics of a container operation are

determined by turn-around, water transportation is not customarily used. However, when Bins are shipped by barge, lifting lugs are frequently added to the top of the Bin to permit ease in sling handling.

STORAGE AND DISCHARGE AT THE PLANT

Now that the Bins have been filled and transported, they are ready for storage and discharge at the plant. In warehousing, the Bins are handled with standard lift truck equipment and, by high-piling only two high a carload of material can be stored in less than 400 square feet of warehouse storage space.

This is considerably less space than required for storage in bags, drums, large horizontal storage bins, and is quite comparable with most silo storage.

When ready for discharge, the Bins are taken to a Tote Tilt discharge mechanism which normally will be located as close to the use point as possible in order to eliminate extensive conveying equipment.

There are dozens of different types of discharge mechanisms that can be utilized, depending on the particular operation involved. However, all operate on basically the same principle. By lift truck, the Bin is placed on a Tilt mechanism, with the discharge door facing into the Tilt hopper. The Tilt is then elevated, rotating the Bin to a 45 degree position, either by using an overhead electric hoist or by using a pneumatic cylinder under the Tilt tongue.

When the Bin is in the discharge position, it automatically is clamped into place, sealing against the gasket on the Tilt for dust-free operation. The discharge door of the Tote Bin is then opened so that product drops into the Tilt hopper. One type Tilt available is the gravity Tilt, which permits material to discharge through the Tilt into a surge hopper or processing equipment.

Screw mechanism for batch weighing, blending

Where batch weighing or blending is required, a Tote Tilt with a screw mechanism in the bottom is utilized. One method of batch weighing is to mount the screw type Tote Tilt and drive motor on a scale platform. The operator sets on the scale dial the amount of product desired to be drawn out of the Bin and pushes the button.

When this amount of material has been fed from the Tilt station, into the use point, the needle of the scale dial comes back to zero and automatically cuts off. This is known as the subtract weighing procedure which permits drawing small batches out of the large Bin.

Another automatic batch weighing method is to feed material from the screw type Tilt into a weigh hopper. Frequently several different ingredients are desired in a batch and this is handled by setting up several Tilt stations around the weigh hopper. The scale can be set up to automatically draw the desired size batch out of each of the various Tilt stations in order.

VICTOR CHEMICAL'S PROBLEM SOLVED

An efficient in-plant operation is an installation at the Victor Chemical Works in Chicago Heights, Illinois. The problem here was *uniformity of specialty phosphates*, turned out on a continuous basis.

The problem was solved by putting all processed material into Tote Bins and holding them until laboratory

checks were received. The Bins are blended by discharging through two screw-type Tote Tilts, which feed into the boot of the bucket elevator and convey material to finished packaging.

One of these screw-type Tote Tilts has a standard drive motor, and the other has a variable speed drive. Consequently, they can blend at any desired ratio called for by the laboratory analysis.

HOW TO USE RAIL ECONOMICALLY

Where truck transportation does not prove as economical as rail, there are two types of installations involving rail shipments. First, the Bins can be shipped in a Container Car, and as mentioned previously, no freight cost is paid on the weight of the Bin when loaded with product or when being dead-headed empty.

Several thousand Tote Bins have been put in this type of service by customers such as Du Pont, Standard Oil, Monsanto Chemical Company and Victor Chemical Company. The Container Car is designed in such a manner that the Bins can be filled without removing them from the car, if desired. When the car arrives at the customer's plant, the loaded Bins are removed from the car by one man with a standard lift truck in less than an hour, and a set of empties put back on the car for return to the supplier.

The other type of rail shipment involves the use of bulk hopper cars. On many installations handling certain products, it is more economical to make the long haul shipment in bulk hopper cars rather than to ship the Bins back and forth on a Container Car.

When the bulk hopper car arrives at the customer's plant, mechanical or pneumatic conveying equipment is used to transfer the material into Tote Bins. Normally, a distribution conveyor is set up over a line of Tote Bins so that no operator need stand by while the Bins are being filled. In handling material such as flour, which would not readily flow from conventional bulk hopper cars, the GATX Airslide car is normally used. National Biscuit are now putting in Airslide-Tote installations of this type into their bakeries at Denver and St. Louis.

OTHER INSTALLATIONS DISCUSSED

A recent installation of this type, using conventional hopper cars, was put in for the O. Hommel Company in Carnegie, Pennsylvania, manufacturers of frit. In this installation, six of their incoming ingredients are received in bulk and transferred into Tote Bins. At the discharge stations, the screw-type Tilts are again tied in with automatic scaling equipment to draw the desired size batches from any of these six ingredients.

Complete package installations are available, including not only the Tote Bins and discharge equipment, but also any of the conveying equipment and scaling equipment required. Many of even the larger companies prefer to handle the package installations on a lease basis rather than as an outright purchase. This eliminates the necessity of a large capital investment and the lease payments are tax deductible.

In some cases, it has been felt that a containerized system of bulk handling is only a halfway step between bag handling and handling in large, fixed silos. A careful analysis will usually show this is not the case and that the labor handling costs are quite comparable.

A carload of material in Tote Bins can be unloaded in one to two manhours, which is as fast or faster than transferring from a bulk hopper car into a large silo. Therefore, the only extra labor cost in handling Tote is in interchanging Bins at the Tilt stations. It takes approximately 4 minutes to interchange a Bin at the Tilt station, and a customer using 100,000 lbs. of material per week would be interchanging approximately 25 Bins. This means spending less than 2 manhours per week and actually the job is normally accomplished by an operator who must be in the area for other purposes.

OTHER TYPES OF PORTABLE CONTAINERS USED

A number of other portable containers have been introduced over the past few years and it might be well to briefly discuss some of these. Quite a little work is being done with cardboard boxes having a capacity of from one to three thousand pounds. Normally these are one-trip containers and are primarily adaptable to small or medium size users.

The cost of the cardboard compared with the paper bag in cents per cwt is normally about the same or slightly higher, but the customer does derive a more efficient method of car unloading and in-plant handling.

In some cases cardboard box assemblies are arranged so that they can be returned and re-used. This reduces the container cost but adds cost in the return freight and re-assembling.

Another type of container is the rubber bag, which again is adaptable for either truck or rail shipment. The most commonly used size is a unit approximately 300 cu. ft. in capacity, handling 10,000 lb. loads. It is a little less than 8' in diameter and is approximately 8' high.

It is handled by picking it up from the center of the top, which means special lift truck or crane equipment and, due to its large size, requires large doorways, rugged floors and plenty of room.

The primary purpose of the rubber bag was to permit collapsing for a more economical return shipment prior to the advent of the Container Car where containers can be returned free.

A number of other types of metal portable containers have been developed and, to avoid the patented discharge arrangement of the Tote Bins, have usually been a hopper top or a hopper bottom type of unit. One such container developed several years ago was called the "Neste-a-Bin." This bin is a 3-unit bin, comprised of a pallet bottom and two body sections that permit nesting. The primary purpose of this unit was again to permit cheaper return freight. Only free-flowing materials have been handled in this unit as they are discharged through a comparatively flat hopper bottom arrangement.

Another container design has cone top and a drum closure. For discharge, the bin is inverted upside down and emptied through the drum opening.

Containerization for bulk handling dry materials is still in its infancy and undoubtedly dozens of other designs and ideas will be forthcoming. In a comparatively brief paper it is rather difficult to get into all the details and economics of containers compared with other bulk handling techniques, such as large fixed storage bins. ▲

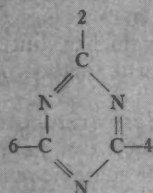
TECHNICAL REVIEW

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Late Research Report:

During the past few years, Simazine (2-chloro-4, 6-bis (ethylamino)-s-triazine) and several other triazine herbicides have been evaluated as selective and non-selective herbicides. The compound designated Chlorazine was released as Geigy 444E (emulsifiable) during 1955 by Geigy Agricultural Chemicals to various research personnel for evaluation purposes. During 1956 Simazine was released, and the following year the triazine compounds designated Propazine, Trietazine, Ipazine, Simetone and G-30451 were made available to various research personnel for investigational purposes. This past year, 1958, Geigy Chemical Corporation made available research samples of other triazine-derivative compounds which were designated Atrazine, Prometone, G-32293, G-30026, G-32292 and G-31717. The present article is an attempt to summarize the results obtained with the above mentioned compounds (and denote their potential uses).

The above compounds differ from each other by various chemical substituents at the 2, 4 and 6 positions of the ring as follows:



Compound	Code No.	2	4	6	Water Solubility ppm at 20 to 22°C
Simazine	G-27692	Chloro	ethylamino	ethylamino	5
Chlorazine	G-25804	Chloro	diethylamino	diethylamino	10
Propazine	G-30028	Chloro	isopropylamino	isopropylamino	8.6
Trietazine	G-27901	Chloro	diethylamino	ethylamino	20
Ipazine	G-30031	Chloro	diethylamino	isopropylamino	40
Atrazine	G-30027	Chloro	ethylamino	isopropylamino	70
	G-30026	Chloro	methylamino	isopropylamino	260
	G-30451	Chloro	propylamino	isopropylamino	42
Simetone	G-30044	Methoxy	ethylamino	ethylamino	3200
Prometone	G-31435	Methoxy	isopropylamino	isopropylamino	750
	G-32293	Methoxy	ethylamino	isopropylamino	1800
	G-32292	Methoxy	methylamino	isopropylamino	3500
	G-31717	Methoxy	diethylamino	isopropylamino	—



Applied at the rate of 4 lbs. wettable powder per acre, the plot at left received excellent weed control with Atrazine 50-W and no cultivation was necessary. Plot at right was plagued with buttonweed.

TRIAZINE

By CLAYTON E. BARTLEY*

CHLORAZINE TESTS

Preliminary test results in 1954 and 1955, indicated that chlorazine held promise for weed control in such crops as cotton, corn, snapbeans, tomatoes, sugar cane, carrots, onions, potatoes, and a few other crops. The compound did exhibit selectivity to the above-mentioned crops, but it had to be utilized at comparatively high dosage rates for practical control of broadleaf and grassy weeds. In addition, other triazine-derivative compounds which were subsequently tested, appeared to exhibit more favorable action.

Simazine has been utilized experimentally and commercially formulated mainly as a 50% wettable powder; however, the compound has been and is being tested formulated as a granular material containing various amounts of active ingredient, formulated as an 80% wettable powder, as a paste formulation, and also as a Simazine-vermiculite formulation.

Preliminary field screening trials were conducted with Simazine during 1955, and the compound was so outstanding for weed control in corn that it was released for limited testing in this crop during 1956. Preliminary test results were verified by approximately 50 different research workers during 1956 and Simazine was widely tested during 1957, mainly for weed control in corn, although the compound was evaluated in other crops. During the early part of 1958, label claims were accepted for the use of Simazine in several different ornamental and nursery plants and for use in sweet corn, field corn, silage corn, and seed corn. Other possible uses of the compound have been and are being investigated.

* Geigy Agricultural Chemicals, Division of Geigy Chemical Corporation

NEW COMPOUNDS

Research results for the past three years and commercial results during the past year tend to verify that a pre-emergence to weeds application of Simazine at dosage rates of 1 to 4 lbs. active ingredient per acre broadcast, depending largely on soil type, controls a wide variety of annual broadleaf and grassy weeds for a period of 2 to 3 months; generally, corn has not been adversely affected from Simazine dosage rates as high as 16 lbs. active per acre. Several research workers have reported favorable results from a post-emergence application of Simazine to the weeds and corn, although satisfactory weed control has been inconsistent by this type of application.

Results with C-14 labeled Simazine⁹ indicate that corn plants can metabolize or degrade Simazine, thereby resulting in no residue of the compound in corn when the compound is utilized at dosage rates of 1 to 4 lbs. active ingredient per acre.

Simazine has been tested in different varieties and types of corn, to determine possible adverse effects of the compound. Danielson⁴ in 1958, made pre-emergence spray applications of Simazine at 2, 4, and 8 pounds active ingredient per acre in eight corn varieties of sweet corn. He found that all eight varieties showed differential responses at the highest rate of application, but there was no significant differential varietal responses to Simazine when the herbicide was applied at the minimum effective weed control dosage rate for effective weed control. In addition, Simazine did not affect the date of maturity or reduce the quality or yield of the various sweet corn varieties when applied at minimum effective rate for weed control.

Meggitt⁷ applied a pre-emergence



In the foreground is a close-up of corn treated with Atrazine 50-W.

application of Simazine at 2 pounds active per acre for weed control in ten of the more common inbred lines of field corn in New Jersey and found that Simazine caused no reduction in stand, surviving plants, or yield in any of the inbred lines. Rogers¹⁰ applied Simazine pre-emergence at dosage rate of 2.5 pounds active per acre for annual weed control in ten different inbred lines of corn and found no visual evidence of injury to any of the inbred lines.

Soil Residual Action

A considerable amount of work has been conducted to determine the soil residual action of Simazine and the possible adverse effects to succeeding crops following an application or applications of Simazine for weed control in corn. The majority of results indicate that most crops can be successfully planted and grown one year after a pre-emergence application of Simazine at recommended dosage rates. Bayer and Buchholtz¹ applied Simazine on May 21, 1956, at dosage rates of 1, 2, and 4 lbs. active per acre for weed control in corn; in the spring of 1957, the area treated in 1956 was sown with spring wheat and oats to determine the residual action of Simazine. No residual effect was detected prior to or at the maturity of the grain, they reported.

Perhaps the most extensive study has been and is being conducted by

Scudder¹¹ at the Central Florida Experiment Station, Sanford, Florida, who initiated two permanent-plot experiments during 1957 to evaluate the accumulation and persistence of Simazine in a fine sand soil and in a peat soil. Twelve different treatments, on each soil type, included the following:

- 1) Single initial application mixed into the top 4 inches of soil, using 1, 2, 4, 8 and 16 pounds active per acre in the sand soil and dosage rates of 2, 4, 8, 16, and 32 pounds active per acre in the peat soil.
- 2) An annual pre-emergence spray every spring using Simazine at dosage rates of 1, 2, and 4 lbs. active Simazine per acre on sand and dosage rates of 2, 4, and 6 lbs. active per acre on peat soil.
- 3) Semi-annual spray applications at planting time each spring and fall seasons, at dosage rates indicated in (2) above.

The tests were initiated in April 1957 on the peat soil and in December 1957 on the sand soil; sweet corn was planted in all of the plots at the first crop planting, but several other crops were subsequently utilized. In December 1957, corn, cabbage, peas, and turnip were seeded in the plots established in peat soil, and all crops grew normally in plots which had

TECHNICAL REVIEW

been sprayed in April, 1957 with up to 6 lbs. active Simazine per acre. In plots where Simazine had been incorporated in the soil, squash planted one year later appeared normal in the 8 lbs. per acre plots and was only slightly stunted on the 16 and 32 lbs. per acre plots. In the tests conducted in a sand soil, oats and several vegetable crops planted one year after application grew normally on all plots which had received less than 16 lbs. of Simazine per acre and also on all plots which had received pre-emergence sprays approximately 1 year previously. Oats appear to be quite sensitive to Simazine and several research workers are utilizing oats as an indicator crop in bio-assay test work.

Research personnel of several State and Federal Experiment Stations are now studying the possible residual effect of repeated applications of Simazine on various crop plants. Present recommendations in some states advocate the use of band treatments of Simazine for weed control in corn until additional information is obtained regarding the soil residual activity of the compound. Research results to date indicate that there is less danger of injury to such crops as soybeans, wheat, rye, and vetch, than to more susceptible crops such as oats or small-seeded legumes, following an application of Simazine for weed control in corn. Reports of longest persistence of Simazine have been received from areas of low annual rainfall.

Entrance Through Roots

Pre-emergence application of Simazine to weeds apparently does not prevent the germination of weed seeds, but destroys weeds after gaining entrance through the root system. In order for Simazine to be effective, therefore, the compound must penetrate the soil to the root system area of weeds. The downward movement of Simazine depends largely on amount of rainfall and soil type; penetration is more rapid in sandy soils than in clay or high organic soils under equivalent amounts of rainfall. Montgomery and Freed⁸ applied C-14 labeled Simazine at a dosage rate equivalent to 10 pounds per acre to the surface of soil columns,

followed by application of 12 inches of water during a period of three days. One inch increments of the soil columns were then examined for the presence of Simazine, and although the compound had penetrated to a depth of 7 inches, the maximum concentration of the chemical was found in the surface-to-one-inch depth of soil.

Areas of Promise

Although corn is the predominant crop in which Simazine has been tested and utilized, the compound does appear promising for weed control in several other crops such as grapes, asparagus, strawberries, wheat, tomatoes, raspberries, cranberries, blueberries, sugar cane, pineapple, and fruit orchards. In addition to crop use, Simazine has performed favorably for the control of several aquatic weeds in some tests, as a chemical fallow treatment, and for weed control in shelter belts. As mentioned previously, Simazine is now registered for use as a non-selective or industrial herbicide and as an herbicide for use in woody species of ornamental and nursery crops.

Grapes have not been injured by Simazine at dosage rates as high as 10 lbs. active per acre, a dosage rate in excess of that which is necessary to control most annual broadleaf and grassy weeds generally predominant in vineyards. Simazine has been least effective for vineyard use in localities where such perennial weeds as Bindweed (*Convolvulus arvensis*) are present, since the compound is rather ineffective against such weeds, particularly at dosage rates tolerated by grapes.

Simazine has been evaluated for weed control in asparagus seedlings and in established asparagus; a single spring application at a dosage rate of 2 to 3 lbs. active has given satisfactory weed control without causing adverse effects to established asparagus plants. Results in asparagus seedlings have been inconsistent regarding injury at these dosage rates.

In Strawberries

Simazine has been tested extensively for weed control in strawberries and the most favorable results have been obtained in the northwestern states, employing the

compound as a fall or winter application primarily for control of winter annual weeds. In most tests, the effective dosage rate has been 1.5 to 2.0 lbs. active per acre. Differential strawberry varietal responses have occurred, and it appears that the variety Marshall is most resistant, the variety Silet intermediate, and the variety Northwest most susceptible of these three commonly grown strawberry varieties in the northwestern areas of the United States. In other areas of this country, the compound has been evaluated mainly as a spring application, and data indicates that injury to strawberries may occur, especially to runner plants, if the compound is utilized at dosage rates in excess of approximately 1.5 lbs. active per acre.

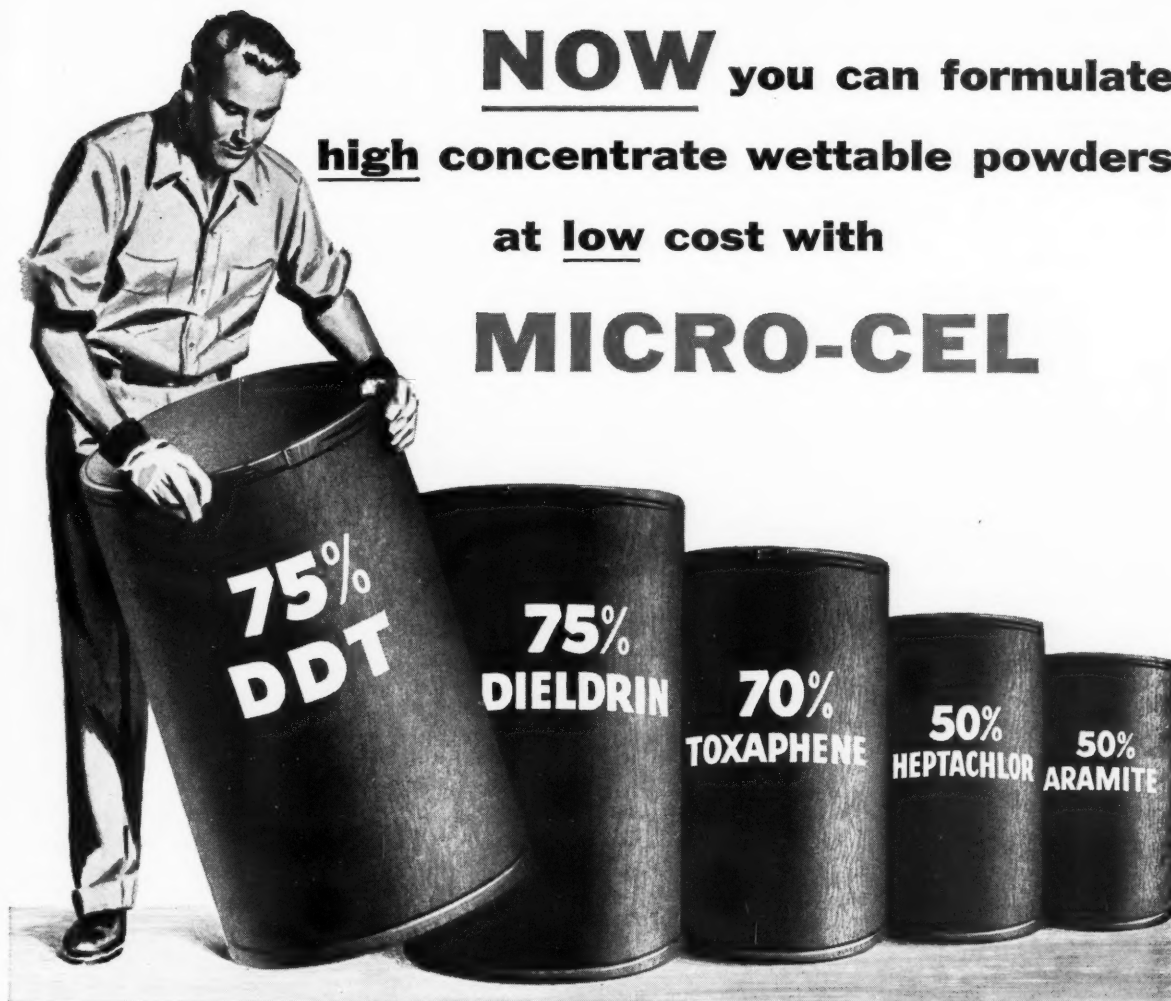
Encouraging results have been obtained in the Pacific Northwest using Simazine as a selective pre-emergence chemical for control of annual broadleaf and grassy weeds in winter wheat; a dosage rate of 1.5 to 2.0 lbs. active per acre has controlled the common broadleaf weeds and grasses, including cheatgrass (*Bromus tectorum*), without adversely affecting wheat.

In Tomatoes

Beneficial results have occurred in tests with the use of the compound for weed control in transplanted tomatoes. Tests conducted by about 30 different research personnel with Simazine 50% wettable powder during 1956, indicated a favorable potential in tomatoes. However, during 1957, some reports were received of injury to tomatoes with the wettable powder formulation, while a granular formulation of Simazine did not injure the crop. Simazine was rather extensively tested during 1958, emphasizing use of a granular Simazine formulation, which, at a dosage rate of approximately 1.5 lbs. active per acre, yielded satisfactory weed control without injuring the tomato plants or adversely affecting the tomato yield.

Results with the compound for weed control in cranberries suggest dosage rates of approximately 4 lbs. active should be further investigated; such rates have controlled many broadleaf and grassy weeds commonly found in cranberries, without causing injury to the crop.

(Continued on page 32)



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TECHNICAL REVIEW

In some tests, dosage rate as high as 8 lbs. active has exhibited symptoms of toxicity in cranberry plants.

Sugarcane, Pineapple

Tests with Simazine for weed control in sugarcane and pineapple have been extremely satisfactory; experiments conducted with C-14 labeled Simazine suggest that a rapid dissipation of the compound occurs within both sugarcane and pineapple plants. Extensive field tests have been conducted in Hawaii and Puerto Rico comparing the efficacy of Simazine with the commonly used herbicides with excellent results. Simazine advantageously, does not cause chlorosis in pineapple plants, a situation which happens with some of the other commonly used herbicides; an overall spray of Simazine at a dosage rate in excess of 200 lbs. active per acre has not caused visible injury to pineapple plants. The utilization of Simazine in the sugarcane industry of Louisiana has been unsuccessful, mainly due to presence of Johnson grass (*Sorghum halepense*) which Simazine usually does not control.

Results with Simazine for weed control in various fruit orchard crops have been favorable but final evaluation of possible detrimental effects cannot yet be determined because of the nature of such crops.

Tests have been conducted with Simazine for control of aquatic weeds and although the compound appears promising, results to date are inconclusive.

Simazine has appeared promising as a winter and summer fallow treatment in wheat production areas. In the Pacific Northwest, dosage rates of 2 to 3 lbs. active per acre have failed to adequately control volunteer wheat, but the addition of either Amitrol or Dalapon with Simazine has proved satisfactory.

TRITIAZINE, PROPAGINE AND IPAZINE

The compounds designated Trietazine, Propazine, and another compound now designated Ipazine have been tested for weed control in corn and other crops. Corn tolerates all of these compounds,

but they have been inferior to Simazine on the basis of equivalent dosage rates for weed control in corn; however, these compounds have appeared promising for weed control in some crops outside the scope of Simazine use.

Comparison with Simazine

Propazine, formulated as a 50% wettable powder, very nearly approaches the weed control activity of Simazine. Research results indicate that Propazine may be useful for weed control in such crops as sorghum, carrots, and celery. Propazine, like Simazine, enters weeds and plants through the root system and has little if any foliage contact activity. Brink² conducted studies on the path of entrance in tomato plants of Propazine, Simazine, Trietazine, Ipazine, and Chlorazine, applying each compound at dosage rates of 1 and 4 pounds active per acre as a soil treatment and as a foliar treatment to tomato plants. He reported that Propazine and Simazine had a rapid rate of entrance through the roots but neither compound appeared to be absorbed through the foliage; the remaining compounds listed above entered tomato plants through both the roots and foliage.

Trietazine has been available formulated as a 50% wettable powder but has to be utilized at dosage rates two to four times greater than Simazine for comparable weed control. Test results indicate that Trietazine may be useful for weed control in such crops as potatoes, peas, tobacco, strawberries, and possibly soybeans and lima beans. Satisfactory weed control in potatoes has been obtained with Trietazine when applied pre-emergence at a dosage rate of 2 to 4 pounds active ingredient per acre. The compound has been evaluated for weed control in tobacco, applied either pre-transplanting or post-transplanting, with slightly better results obtained by a pre-planting treatment.

Ipazine has been available as an emulsifiable formulation containing 2 pounds of active ingredient per gallon. The compound has been tested mainly as a post-emergence directed application in either water or a non-phytotoxic oil for weed

control in cotton. Preliminary test work indicated that Chlorazine might be useful applied post-emergence directed for weed control in cotton, but recent results favor the use of Ipazine rather than Chlorazine. The most extensive studies have been conducted by Holstun and Bingham⁵ at the Delta Branch Experiment Station, Stonesville, Mississippi, who have been evaluating several different triazine-derivative compounds during the period 1955-1958. Of seven triazine-derivative compounds studied as selective post-emergence herbicides in cotton, they have reported that Ipazine was the most selective on young cotton and the effective dosage rate for weed and grass control was approximately 2 pounds per acre.

ATRAZINE

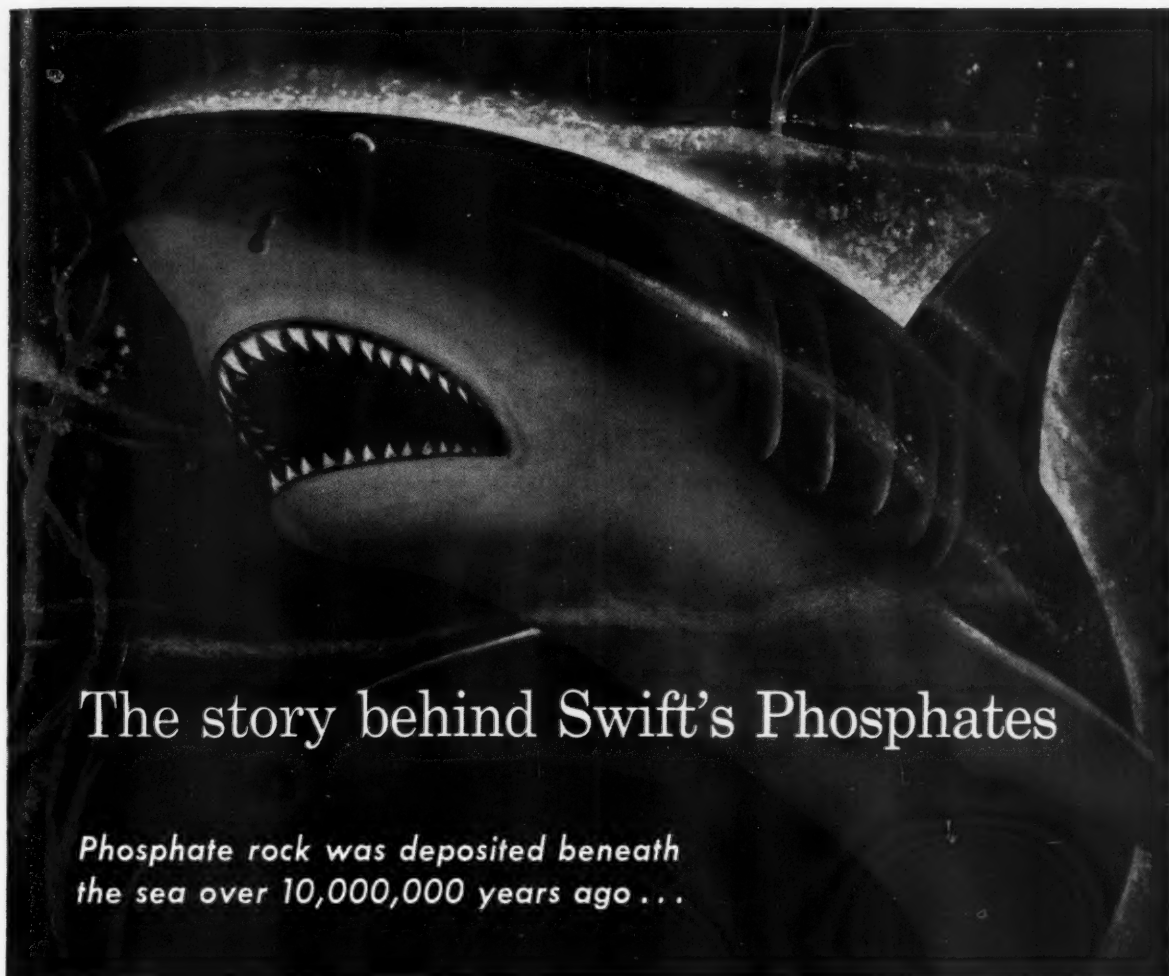
Atrazine was rather extensively tested by various research personnel during 1958, mainly for weed control in corn. At equivalent dosage rates, Atrazine has performed as satisfactorily as Simazine when applied pre-emergence and also has exhibited excellent selectivity and weed control when applied post-emergence to corn and weeds.

Atrazine appears very promising for weed control in corn for several reasons:

- ▶ It is more water soluble than Simazine. Soil moisture is not as critical with Atrazine as has been experienced with Simazine;
- ▶ Atrazine can be utilized either as a pre- or post-emergence application to weeds whereas Simazine is primarily a pre-emergence chemical;
- ▶ Preliminary results indicate that Atrazine is less persistent than Simazine in soils.

Montgomery and Freed⁹ utilizing C-14 labeled Atrazine found that corn is able to metabolize or degrade the compound at a more rapid rate than was discovered for Simazine.

Lachman and Michelson⁶ during 1958 tested several herbicides applied pre-emergence for broadleaf weed and grass control in corn, which among other compounds included Simazine at 1.0, 1.5, and 2.0 pounds active per acre and Atrazine at similar dosage rates. With soil moisture conditions described as not optimum for best results with the standard pre-emergence herbicides for corn, the plots treated



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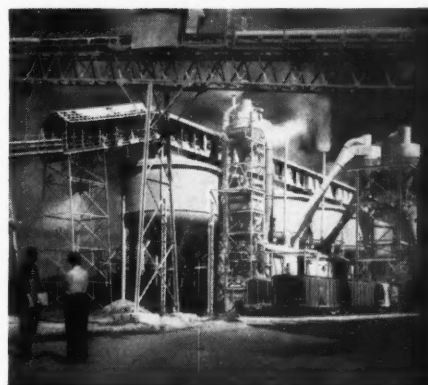
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TECHNICAL REVIEW

with Atrazine at 2 pounds active per acre were practically free from all weed growth five weeks after treatment and at equivalent dosage rates was superior to Simazine.

Chilcote and Furtick³ conducted extensive tests with Atrazine in Western Oregon during 1958 for weed control in corn and report that "pre-emergence applications as low as one pound active per acre have given effective weed control."

Smith¹² during 1958 tested Atrazine applied pre-emergence and post-emergence for weed control in sweet corn utilizing dosage rates of 1.25, 2.5, and 5.0 pounds active per net acre actually treated. The pre-emergence sprays were applied one day after corn planting, and the post-emergence sprays were applied seventeen days after corn planting when the corn was 6 to 8 inches tall and broadleaf weeds and grasses approximately 2 inches in height. Broadleaf weeds and grasses in the test area included Redroot pigweed (*Amaranthus retroflexus*), Lambsquarters (*Chenopodium album*), Ragweed (*Ambrosia elatior*), Purslane (*Portulaca oleracea*), Common Chickweed (*Stellaria media*), Crabgrass (*Digitaria sanguinalis*), Green Foxtail (*Setaria viridis*), Barnyard grass (*Echinochloa crusgalli*), and Nutgrass (*Cyperus esculentus*). He reported that all broadleaf weeds and annual grasses were controlled by the pre-emergence application at the 1.25 pounds dosage rate and the same dosage applied post-emergence controlled all broadleaf weeds; a dosage rate of 2.5 pounds per acre applied post-emergence resulted in approximately 70% control of annual grassy weeds. None of the treatments adversely affected the sweet corn.

As mentioned previously, Atrazine has not yet been tested for weed control in crops other than corn although tests will be conducted to evaluate its possible use in other crops. Atrazine is now registered for use as an industrial or non-selective herbicide; as indicated previously, the compound is less persistent than Simazine in soils but does have the advantage of yielding more satisfactory control of deep-rooted perennial weeds than has been experienced with the use of Simazine.

G-30451 AND G-30026

The compound designated G-30451 has not appeared particularly promising and further tests with the compound are not actively being pursued. In preliminary trials, G-30026 applied pre-emergence has exhibited selectivity to sorghum; however, with the exception of possible use in sorghum, G-30026 does not appear as useful as some of the other previously-mentioned triazine-derivative compounds.

METHOXY ANALOGUES

Another group of triazine-derivative compounds which have been available for test purposes include several methoxy analogues of the previously mentioned chemicals; these materials include compounds designated G-30044, G-31435, G-31717, G-32292 and G-32293 which are the methoxy analogues of Simazine, Propazine, Ipazine, G-30026, and Atrazine, respectively.

G-30044 was the first methoxy analogue triazine-derivative compound released for evaluation purposes; it was found to be rather ineffective when applied pre-emergence for weed control, but when applied non-directed post-emergence to weeds and crop, the compound exhibited strong contact effects accompanied by an extremely low order of selectivity.

Even though corn tolerates rather large dosage rates of the chlorine analogues applied either pre-emergence or post-emergence, corn is much less tolerant to applications of the methoxy analogues. Tests with the methoxy analogue compounds have not been extensive, but preliminary results suggest that further experiments should be conducted with the chemicals applied pre-emergence for weed control in soybeans, and applied directed post-emergence for weed control in cotton.

G-31435, which has better contact value than has been experienced with G-30044, has been tested as a non-selective or industrial herbicide and has performed satisfactorily at a dosage rate of approximately 10 pounds active per acre when applied post-emergence to perennial broadleaf and grassy weeds. It has shown excellent

promise in Texas for Johnson grass control.

IN SUMMARY

A brief account of thirteen triazine-derivative herbicides has been given, principally attempting to indicate the various crops in which the chemicals have appeared promising. Continued research may substantiate or disprove presently available data and information. Additional uses could be mentioned, but due to insufficient experimental data such remarks would be premature. ▲

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*Clupak, Inc. trademark for extensible paper manufactured under its authority.

NEWS OF THE INDUSTRY

GRACE, PECHINEY, FOSTER-WHEELER TO OFFER UREA PROCESS

Three companies representing three stages in the life of a chemical process—process development, plant engineering and construction, and production—have entered a novel arrangement for future sale of a proven process to make urea.

Pechiney of France who pioneered the total recycle process by making urea from ammonia and carbon dioxide using a neutral oil slurry to recycle unconverted raw material, will license its original "know-how" and rights through Foster-Wheeler Corp., an engineering and construction firm. The process will be commercially augmented by joining with the operating experience obtained over the past five years by W. R. Grace & Co., one of the first licensees of the Pechiney process in the United States.

The new arrangement, says W. R. Grace, will benefit companies interested in making "a urea of exceptionally high purity and low biuret content for fertilizers, animal feed and industrial uses..."

COMINCO BUILDS \$5 MILLION UREA PLANT AT CALGARY

Immediate construction of a \$5,000,000 urea plant at Calgary, Alberta, was announced March 20 by The Consolidated Mining and Smelting Co. of Canada Ltd. To be operated in conjunction with the company's ammonia and fertilizer plants in that city, the new facilities will have an annual capacity of more than 36,000 tons.

MICH. REPORTS ON PROFIT FROM FERTILIZING GRAIN

Upper Michigan farmers growing small grains can get back nearly double the money spent on ammonium nitrate in one season, according to a report from Michigan State University.

Research at the Upper Peninsula Experiment Station at Chatham, Mich., shows that farmers can get an increase in yield of 17 bushels for each 33 pounds of nitrogen fertilizer top-dressed immediately after the grain is planted.

S. M. King, agronomist and

superintendent of the station, explains the return on investment this way:

Thirty-three pounds of fertilizer, at 15 cents a pound, cost \$4.95. Adding \$1 per acre to cover costs of spreading the material brings expenses to \$5.95 per acre.

The 17 bushels of extra yield at 60 cents a bushel is \$10.20 added income per acre. Net income is increased \$4.25 per acre.

HAYES-SAMMONS INCREASED SALES 219% SINCE 1954

Hayes-Sammons Chemical Co.'s president, Thomas B. Sammons, Jr., has announced a net sales increase of more than 219 per cent since 1954. Total sales were \$8,576,911 in 1958, compared to \$2,658,658 in 1954.

The firm, which began as a local hardware and feed store, now operates three plants and five affiliate companies.

AERIAL FERTILIZATION OF MOUNTAIN PASTURES IS DEMONSTRATED IN N. C.

Fertilizer may soon be taking to wings over mountain pastures too steep to reach by ground spreader and flatlands too wet to enter when they need fertilizer, reports the American Potash Institute.

Through a demonstration sponsored by Watauga County agricultural workers, the Western N. C. Development Council, TVA and the American Potash Institute, hundreds of western North Carolina farmers have seen two airplanes apply 25 tons of 0-30-30 fertilizer on grasslands ranging from 30 to 60 per cent in slope.

Sam Dobson, agronomy extension specialist at N. C. State College, reported on this unusual project in the Institute's "Better Crops with Plant Food."

With most farmers, "to see is to believe." And through this demonstration, they saw a team of crop dusters, Yadkin Valley, Inc., topdress 166 acres in two days—on pastures varying in size from 3 to 20 acres.

Three hundred pounds per acre of 0-30-30 fertilizer was applied at a per-acre application cost of

\$3.75 for 180 pounds of plant food. The planes fertilized one acre every 3 minutes while actually operating.

Uniformity of application was good, Dobson reports. Little drift of material occurred, because little wind was stirring. (The dusters don't apply in wind strong enough to drift materials.)

Farmers were told that some problems would have to be solved before the practice could be generally adopted in western North Carolina.

But in New Zealand, which Dobson visited two years ago, they topdress between 8 and 10 million acres of pastures each year by plane.

The same Yadkin Valley dusters recently were called to southwest Virginia to topdress a large area of pastures. And Dobson and his Extension team hope to put on another demonstration sometime this spring.

Free copies of Dobson's full report are available in folder form through News Service, American Potash Institute, 1102-16th St., N. W., Washington, D. C.

NEW INSTRUMENT PROBES "CHEMICAL MYSTERIES"

A \$50,000 instrument that detects unknown chemicals in smog and other substances through their nuclear spin is being readied for use at the University of California, Riverside.

Called a nuclear magnetic resonance spectrometer (NMR for short), it is regarded as the latest word in devices for probing chemical mysteries.

Agricultural scientists at Riverside will use the NMR to analyze the fleeting products of smog reactions, the action of fungicides for preventing fruit decay, the reasons why insects resist insecticides and the substances that account for fruit flavor, among other things.

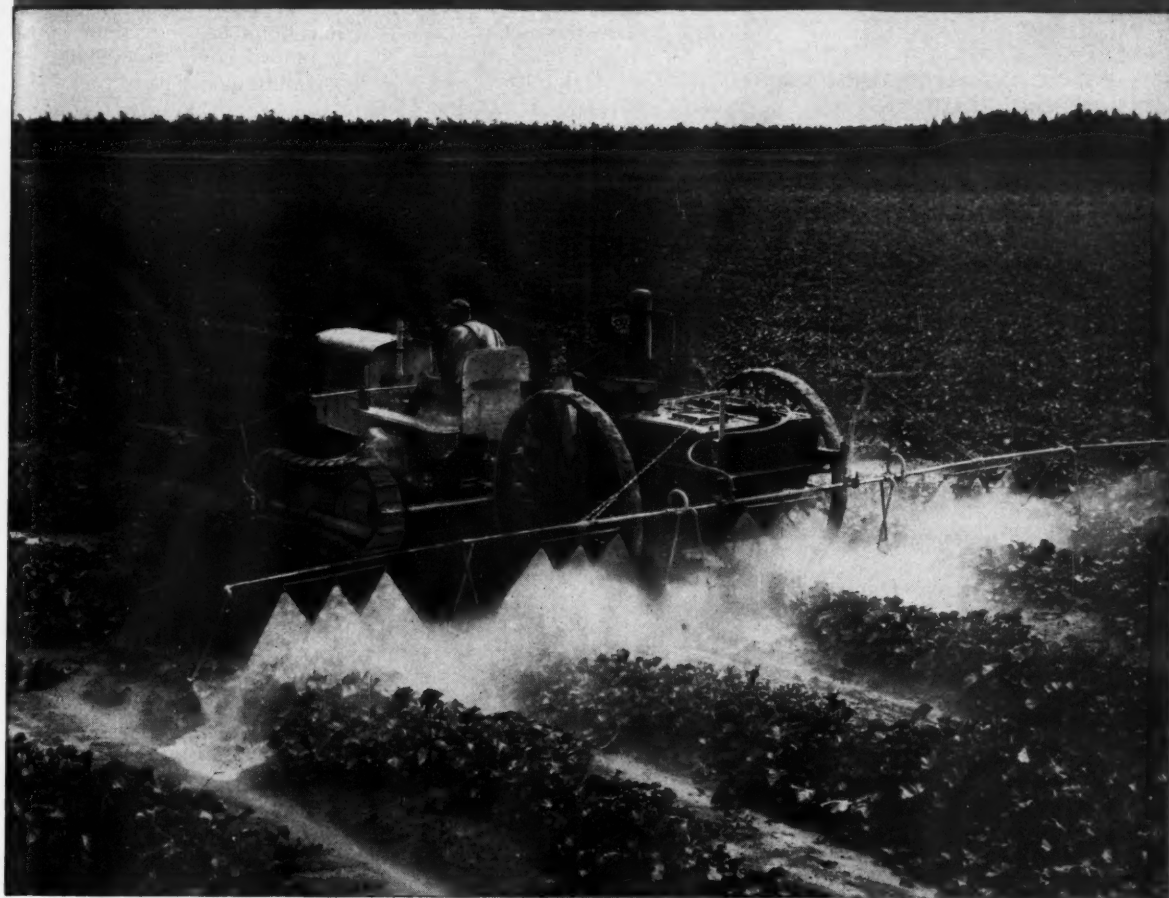
New attacks on fundamental problems in physics and chemistry also are expected to result from use of the NMR.

It consists of a two and one-half-ton magnet, a radio transmitter, a receiver, various recording devices and a control panel.

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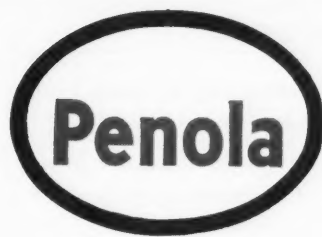


7 good reasons why you should use Penola HAN in your pesticides:

It is ... ● LOW in cost ● HIGH in solvency ● BLENDS readily with active ingredients.

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Use Penola HAN for top quality herbicides, too. Penola HAN is marketed by the Penola Oil Company, manufacturer of Flit—the greatest name in insecticides. For information on how Penola HAN can improve *your* product, just contact your nearest Penola office or write: Penola Oil Company, 15 W. 51st Street, New York 19, New York.



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NEWS OF THE INDUSTRY

MONTROSE CHEMICAL AWARDED DDT CONTRACT

Montrose Chemical Corp. of California reports it has been awarded a supply contract by UNICEF for some 4,000,000 pounds of 75 per cent wettable DDT. The order approximates \$1,250,000.

The company is jointly owned by Stauffer Chemical Co. and Montrose Chemical Co. (Newark, N. J.).

NEW COLOR AND NAME FOR NITROGEN DIV. SOLUTION

Nitrogen Div., Allied Chemical Corp., has changed the color and name of its Uran nitrogen solution. The product, in all grades, is now golden colored rather than clear and is named Golden Uran.

Except for the new color, no changes have been made in the product itself, Nitrogen Div. said.

NEW IMC DIRECTORS

Election of two new directors to the board of International Minerals & Chemical Corp. was announced recently by Louis Ware, IMC board chairman and chief executive officer.

They are Dr. J. W. Dunlap, Stamford, Conn., research scientist and consultant to the U. S. Defense Dept. on its guided missiles and aircraft program, and Henry W. Meers, Chicago investment banker.

Dunlap and Meers replace R. Douglas Stuart, board chairman of Quaker Oats Co., and General Robert E. Wood, a director of Sears, Roebuck and Co., both of whom retired under IMC's maximum age provision for directors.

People

American Agricultural Chemical Co. M. B. Steele, general foreman at the Saginaw, Mich., manufacturing plant, has been named assistant superintendent at Washington C. H., Ohio.

George C. Bollinger, 48, chief chemist at the chemical control laboratory, Baltimore, died on March 25. He joined the firm in 1928 and had been chief chemist at Baltimore since 1945.



Gorman



Schafer



Austin



Hall

American Cyanamid Co., Agricultural Div. James Gorman, manager of nitrogen products since 1944, retired on March 31 after 32 years with the company. C. Paul Schafer, assistant nitrogen products manager, has been named to succeed him.

Schafer joined the company in 1946 as a field representative and became assistant nitrogen products manager in 1950.

Franklin Allen has been named a district manager in the western region for Cyanamid's Agricultural Div. He succeeds H. H. Phillips, who was promoted to assistant regional manager.

Bradley & Baker. James E. Corgill and H. Parker Rea have joined the Atlanta sales office staff. Corgill will cover Tennessee and



Corgill



Rea

the northern half of Alabama and Mississippi, while Rea will service southern Alabama and Mississippi and counties in western Florida and southern Louisiana.

L. H. Butcher Co. has named A. W. "Bud" Austin, Jr. and Tom A. Hall as technical sales representatives in the Yakima valley fruit region. Both will reside in Yakima. Hewitt Harrison, Seattle, is district manager.

Bud Radey has been transferred from Portland to Medford, Ore., where the company recently estab-

lished an office and warehouse. Arthur Bonn has moved to Portland, and will cover the Willamette Valley and Hood River areas.

California Spray-Chemical Corp. Appointment of W. W. Layne as vice president has been announced by A. W. Mohr, president.

Commercial Solvents Corp. Maynard C. Wheeler has been elected president, William S. Leonard financial vice president and treasurer, and Jeremiah Milbank, Jr., chairman of the board of directors' executive committee. Wheeler succeeds J. Albert Woods, who continues with CSC as a consultant.

A vice president of Commercial Solvents since 1945 and a member of the board since 1950, Wheeler started with the firm in 1923. He also is a director and vice president of Northwest Nitro-Chemicals, Canadian fertilizer manufacturing affiliate of CSC, and Petroquímica de Mexico, S.A.

R. Paul Jolley has joined the Agricultural Chemicals Dept. as a sales representative. He will headquarter at CSC's Atlanta, Ga., district office, 550 Glenn St., S.W., servicing fertilizer manufacturing in central and southern Georgia. For the past four years he has been chief



Wheeler



Jolley

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NEWS OF THE INDUSTRY

fertilizer control official for the Ga. Dept. of Agriculture, and director of personnel for that department.

Davison Chemical Div., W. R. Grace & Co. has appointed controllers for its three operating units; John L. Dowell, Chemicals Div.; A. H. Hanssen, Jr., Mixed Fertilizer Div. and Edgar L. Linthicum, Agricultural Chemical Div.

Federal Chemical Co. Bill B. Mainord joins the sales management team, where he will assist Roy Nethery, division sales manager. For the past 10 years he has been with the Missouri Farm Bureau Federation.

Geigy Agricultural Chemicals, Div. of Geigy Chemical Corp. Mr. Gail Van Drasek has been named to the Michigan sales staff. He was formerly employed by the Watervliet (Michigan) Fruit Exchange.

Hopkins Agricultural Chemical Co.



Brunn

Co. Appointment of Lynn K. Brunn as technical service manager has been announced. He had been with Atlas Powder Co. in agricultural chemical marketing activities and with Sherwin-Williams Co. as an entomologist.

International Minerals & Chemical Corp. Donald Lewis of Woodstock, Vt., winner of several agricultural awards last year, has been named supervisor of sales in a six-state area—Maryland, Delaware, Virginia, West Virginia, North Carolina and South Carolina—where he will set up dealerships for IMC rock phosphate in the two states.

Rome Schwagel, vice president of Eastern States Soil Builders, Inc., has been appointed supervisor of sales in a six-state area—Maryland, Delaware, Virginia, West Virginia, North Carolina and South Carolina—where he will set up dealerships for IMC rock phosphate.

Michigan Chemical Corp. George C. Stradley goes to the firm as group leader in charge of chemical engineering research.

Mississippi River Fuel Corp.

While on vacation with his family in Phoenix, Ariz., March 25, Jerry G. Woods, general manager of the Chemical Div., died of a heart attack. Woods had been employed by Dow Chemical Co. from 1941 until 1951, Olin Mathieson Chemical Corp. from 1951 to 1957, and Mississippi River Chemical since 1957.

National Potash Co. Omar Sanders, consultant, died March 29 at his home in Sarasota, Fla. He was 67 years old. Sanders had been in the fertilizer industry for 40 years, working for Armour Fertilizer Works, Fertilizer Industries Incorporated, and after his retirement as consultant for National Potash.

Olin Mathieson Chemical Corp.

Dr. Arthur M. Smith has been named director of agricultural promotion and development for Mathieson urea. He will concentrate chiefly on the area from Michigan east, and down the eastern seaboard. Before joining Olin Mathieson in 1948, Dr. Smith had been vice president and technical director of Synthetic Nitrogen Products Corp.



Smith

Spencer Chemical Co.



McMillan

has added a sales representative to its staff. E. J. "Ed" McMillan will serve Colorado, New Mexico and West Texas. McMillan has been employed by Spencer in production and administrative positions at the Jayhawk Works since 1942.

Sohio Chemical Co. George W. Cosper becomes manager of agricultural sales.



Cosper

Since joining the company in 1956 he had been assistant sales manager. Henry J. Coleman, Sohio sales manager, said that this appointment is in line with the company's expansion program.

Thompson Chemicals Corp.

Appointment of Dr. Louis P. Gerber as research director has been announced. He has worked with Schenley Laboratories, Arden Farms and California Corporation for Biochemical Research.

Virginia-Carolina Chemical Corp.

Newly elected vice presidents are Charles T. Harding (fertilizer manufacturing) and Douglas W. Laird (purchasing). Harding, who joined V-C in 1918, had been general manager of the fertilizer manufacturing department since 1951. Laird was previously manager of the purchasing department.

Associations Meetings

CONF. ON BIOCHEMISTRY AND AGRICULTURE PLANNED

Program for the Third Gordon Research Conference on Biochemistry and Agriculture has been announced by Dr. George L. McNew, managing director of Boyce Thompson Institute and Dr. Robert S. Bandurski, professor of plant biochemistry at Michigan State University. They are serving as co-chairman of the conference, to be held August 3-7 at Kimball Union Academy in Meridan, N. H.

Purpose of the conference is to "bring outstanding research personnel from academic, private and industrial laboratories together in a relaxed environment where there will be freedom for full discussion of subjects of mutual interest."

Among the sessions will be one

(Continued on page 47)

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*Setting New Standards
of Quality Control*

How IMC's
Triple Super Contract
gives you

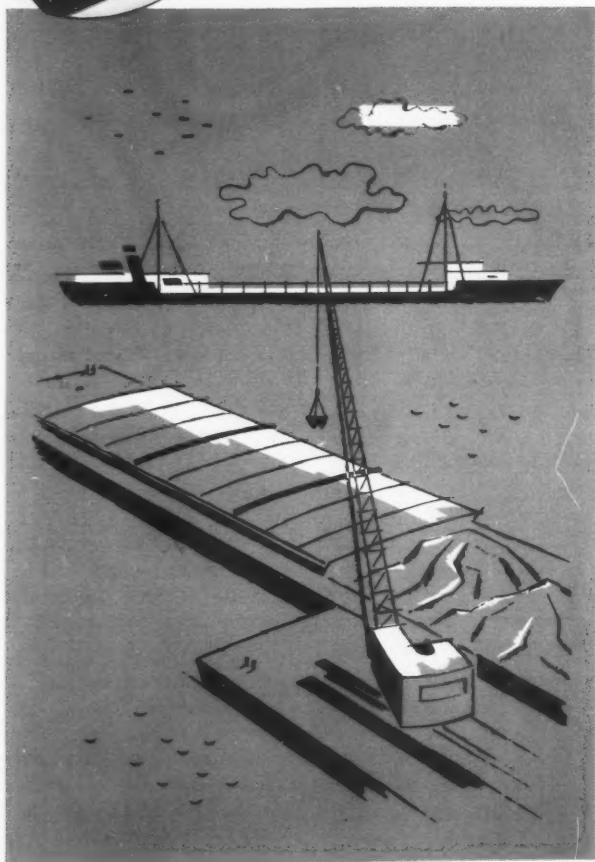
**TRIPLE
VALUE
SERVICE**



and extra dollars in your pocket



International services triple the value of y



IMC transportation service masters the maze of shipping problems for you

Let's face it: delivery can give you skull-busting headaches . . . unless you're protected by International Minerals' General Transportation Service. IMC helps you choose lowest cost methods — ship, barge, rail. IMC offers other advantages, like on-site storage at key transportation centers and rolling warehouse shipments. We can help you with rate negotiations, routing or interpretations of shipping regulations. In short, International Minerals takes the trouble out of triple super shipping.



Triple super trouble shooters - - complete and personalized technical service at your plant

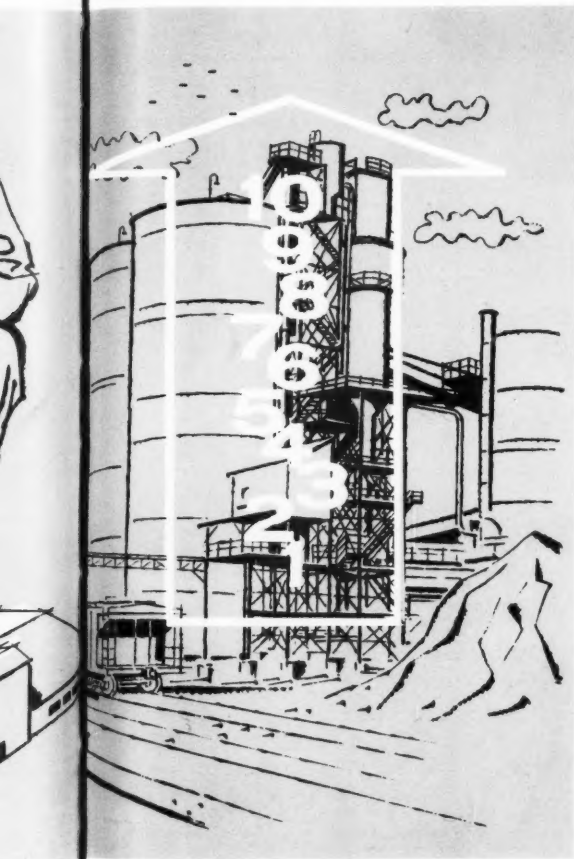
Technical trouble-shooting in the fertilizer business takes experience and personnel. And International Minerals has both — a staff of technicians that stands ready when you need them . . . to help cut your in-plant production problems down to size. Let us help you in formulation . . . choosing equipment . . . designing plant layouts . . . streamlining materials handling . . . or in applying research information. Call on IMC for complete trouble-shooting service that works for you at no cost to you!

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FULL ORBIT SERVICE... IDEAS AND PLANS TO BUILD VOLUME, PRODUCE MORE PROFIT OVER COSTS!

International Minerals' Full Orbit Service is helping fertilizer manufacturers chart new profit strategy.

It's an exciting and *proved* program that sets new standards of service in the industry. First benefit is IMC's extremely high quality triple superphosphate. Then comes Full Orbit technical help in ironing out your in-plant problems... plus help in a host of ways to eliminate your transportation troubles.

Full Orbit Service makes the most of buyer-supplier teamwork to help you solve marketing problems... get the most from your sales manpower... make sales meetings pay off... and get real results from your promotion dollars through professionally planned use of newspapers, radio and TV.

The best part is, International's Full Orbit Service doesn't cost you a cent. Contact your International representative now. There's no obligation. Find out — as many other fertilizer manufacturers have — how IMC's Triple Superphosphate and Full Orbit Service can help you realize extra profits while you benefit from a smoother working operation.

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From mine to manufacturer,
International's quality count-down
adds up to superior product control

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Nobody guards triple super quality as carefully as International Minerals. Over 40 separate tests are used! More than 400 chemical analyses are made daily. IMC absolutely controls triple quality with a count-down that follows the product from raw material to shipment of the finished product. And as a final quality check, every shipment of International Triple Superphosphate has its own certificate of analysis — mailed to you before material arrives at your plant. Depend on IMC for quality.



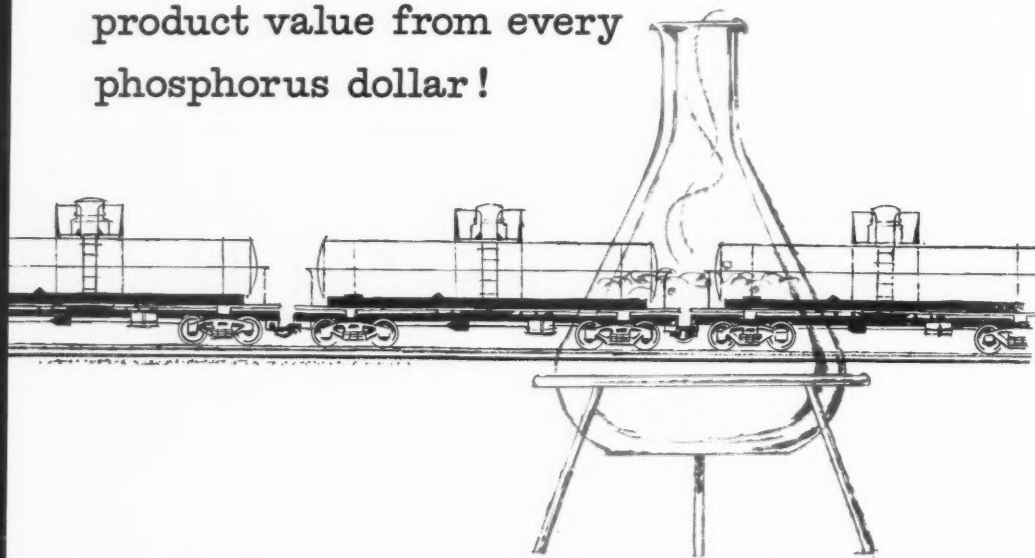
Producers of Living Minerals

COARSE — International's coarse-textured Triple gives you the same excellent ammoniation batch after batch . . . promotes desirable agglomeration.

GRANULAR — International's granular Triple is non-crumbling, free-flowing, easy to apply—makes this product ideal for direct application.

RUN-OF-PILE — International's even-textured Triple provides uniform particle size, even density and high porosity that lets you ammoniate at higher rates, temperatures.

An International contract helps you get full product value from every phosphorus dollar!



TRIPLE SUPERPHOSPHATE

Available P_2O_5 (min. guarantee) — 46.0%

Particle size:

	R.O.P.	GRANULAR	COARSE
—6 mesh	98-100%	97% min.	97% min.
—65 mesh	22-34%	0.5% max.	4% max.

IMC TRIPLE SUPERPHOSPHATES AND PHOSPHATIC FERTILIZER SOLUTION SOLVE FORMULATION PROBLEMS

Now you can make International your dependable single source of all high-analysis phosphate ingredients. Benefit from International's three grades of top-quality triple superphosphate plus high purity 53%-55% phosphatic fertilizer solution. Get all the quality advantages International's processing adds to your product. Be sure with International.

Producers of Living Minerals



SPECIAL PRODUCTS DEPT., PHOSPHATE DIVISION

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois



READER SERVICE

*FREE INFORMATION to help you
solve fertilizer, pesticide problems*

Chemicals

141—TAKO KAOLIN

Use of TAKO Airfloated Colloidal Kaolinitic Kaolin—as a diluent-carrier in formulations of pesticides and as a prilling and coating agent in high analysis fertilizers—increases every year, reports Thomas Alabama Kaolin Co. Produced under laboratory control, TAKO is said to be non-abrasive, non-hygroscopic, non-caking and free flowing. For complete information on the material,

CIRCLE 141 ON SERVICE CARD

142—TABATREX

"With Tabatrex Everybody Profits... Everybody But the Fly" is the title of new literature from Glenn Chemical Co. It describes Tabatrex insect repellent and Glenn's extensive merchandising and advertising program. For your copy,

CIRCLE 142 ON SERVICE CARD

143—EMULSIFIER BULLETIN

A description of Witco Emcol emulsifiers H-710, H-712 and H-714 for 2,4-D and 2,4,5-T ester concentrates, along with a listing of typical weed-killer formulations, is presented in a new Emulsol technical bulletin. These emulsifiers are blends of oil soluble amine sulfonates with polyoxyethylene ethers for formulating low foam concentrates. The manufacturer reports that the emulsifiers exhibit marked sludge inhibiting properties in the finished concentrate. For your free copy,

CIRCLE 143 ON SERVICE CARD

144—SWIFT'S PC-47

An illustrated brochure on its 47 per cent A.P.A. triple superphosphate is available from Swift & Co. The material has "14 billion ammonia traps per ton" for positive ammoniating-ability, the company reports. For your copy of the literature,

CIRCLE 144 ON SERVICE CARD

145—WEED CONTROL BULLETIN

Stauffer Chemical Co. has just published an illustrated brochure describing applications of its selective pre-emergence herbicide, Eptam. Included are outlines of the crops on which Eptam can be used and types of weeds controlled by the herbicide, as well as efficient application methods. Copies are available without charge by

CIRCLING 145 ON SERVICE CARD

146—658 FUNGICIDE

Folders and technical information on Miller 658 Fungicide now are available from Miller Chemical & Fertilizer Corp. Union Carbide Chemical Co. developed "658," which Miller is licensed to manufacture and distribute. Active ingredient

of the fungicide is a copper zinc chromate complex. For information including properties, compatibility, toxicity, uses registered with USDA and performance data,

CIRCLE 146 ON SERVICE CARD

147—GIBREL BOOKLET

"What You Can Tell Farmers About Gibrel," prepared by Merck & Co., Inc., is now available. The semi-technical publication contains information on the practical commercial use of Gibrel, the company's trademark for its brand of gibberellin plant growth substance. The booklet explains what Gibrel is, how it works, its practical uses and formulations. For your free copy,

CIRCLE 147 ON SERVICE CARD

Process Equipment

148—CONTROLLED CAPACITY METERING PUMPS

Clark-Cooper Co., Inc. is producing a new line of controlled capacity metering pumps for laboratory and industrial use. Designated "CC Pumps," the line includes plunger-type and diaphragm-type metering pumps. Both operate on the reciprocating action of a positive-displacement plunger. Standard models range in capacity from one drop every 13 strokes to 1000 gph at discharge pressures to 10,000 psi. Full details and specifications are given in a bulletin, available by

CIRCLING 148 ON SERVICE CARD

149—PVC LINING ON PIPE FITTINGS

A complete line of Plastisol (PVC) lined pipe fittings in malleable iron or aluminum has been announced by Victaulic Co. of America. They are supplied with grooved ends for quick-joining pipe with Victaulic mechanical couplings. Available in elbows, tees, reducing tees, reducers, caps and adapter nipples in sizes from 1¼ inch through 12-inch diameters, the fittings are designed with full flow radii. Victaulic will send you details, if you

CIRCLE 149 ON SERVICE CARD

150—CHECKING CHEMICAL SOLUTION STRENGTH

A colorful booklet describing its new method of checking chemical solution strength has been issued by Etna Electronics. Using a submersible electrode and an easily read dial, the solution indicator eliminates checking by titration, test tubes and other hand methods, according to Etna. Two models are available—one for permanent installation and another for interchangeable use. To get the brochure, just

CIRCLE 150 ON SERVICE CARD

151—SPRAY NOZZLE BULLETIN

S&K spray nozzles for spraying large quantities of liquids at low pressures are the subject of a new bulletin prepared by Schutte and Koerting Co. The nozzles produce medium to coarse, uniformly distributed, solid-cone sprays with a normal spray angle of 70°. The bulletin includes information on capacities, sizes, dimensions and materials of construction—plus photos showing the liquid spray distribution patterns of a nozzle operating at several pressures. Copies can be obtained by

CIRCLING 151 ON SERVICE CARD

152—LOADING ASSEMBLIES AND VALVES

A new two-page bulletin from OPW-Jordan describes how to select loading assemblies for loading and unloading of tank cars and tank trucks. The bulletin shows how you can determine size, range type, materials required and balance type, to determine the loading assembly needed. Also included are full description, illustrations and cutaway photo of shockless, adjustable loading valves. To get a copy,

CIRCLE 152 ON SERVICE CARD

Materials Handling

153—UNDER-OVER WEIGHT INDICATOR

A panel-mounted meter that indicates weighing deviations in terms of dial scale divisions is described in a technical reference bulletin offered by the Richardson Scale Co. It describes the meter, designed to be used with the Richardson "Select-O-Weigh" automatic proportioning system to provide a visual indication of the number of graduations of an "off weight" for each ingredient weighed by the system. Copies are available by

CIRCLING 153 ON SERVICE CARD

how to use the READER SERVICE CARD

- Circle number of literature you want
- Print or type your name, position, company and address
- Clip and mail the Service Card

154—AUTOMATIC FILLING SCALES

Thayer Scale Corp. has issued a four-page bulletin illustrating ten main types of automatic scales. Capabilities of each is discussed, specifications of scales and operational diagrams of three types of feeder actions are given. The book can be obtained by

CIRCLING 154 ON SERVICE CARD

155—H-25 PAYLOADER

The Frank G. Hough Co. reports that its H-25 Payloader has complete power-shift transmission and power-steer. Its carry capacity is 2,500 lbs. Among the H-25's "plus" features, reports Hough, are closed hydraulic system, wet-sleeve overhead valve engine, triple air cleaners, full-shift fuel capacity, 4,500 lbs. of bucket breakout force and 40° bucket tip-back. Full data on the H-25 will be yours, just by

CIRCLING 155 ON SERVICE CARD

156—BULK TRANSPORT

A new Dorsey Bulkmaster self-unloading bulk transport is now being produced by Dorsey Trailers. Called the Bulkmaster model FB-T, it unloads fertilizer, lime, sulfur and other dry granular materials. The unit pit dumps or can be equipped with a 14-foot folding or rigid full-swiveling 18" wide endless-belt conveyor. A tandem hydraulic pump supplies pressure to operate the rubber belt conveyor, which is riveted to a 36" heavy-duty steel conveyor chain, and elevators. The system discharges in excess of one ton a minute, depending on the type of material. Standard body lengths are 20 to 36 feet wide, and the transport is available with single or tandem axles. More information is available. Just

CIRCLE 156 ON SERVICE CARD

Packaging

157—VCA CATALOG SHEET ON "VALVU" BOARDS

The new "Valvu" board, a three-dimensional "catalog" of aerosol valves and other components, is described in a catalog sheet prepared by Valve Corp. of America. The sheet describes sample units and valve components actually mounted on two 11 x 14 inch framed boards now being offered free by VCA to aerosol packagers. To obtain the catalog sheet,

CIRCLE 157 ON SERVICE CARD

Application Equipment

158—GANDY APPLICATORS

Features of the Gandy Hi-Lo Granular Chemical Applicator and Granular Chemical Row Crop Applicator are described in new literature from Gandy Co. The first is used for applying granular insecticides, herbicides and nematocides as well as broadcasting and row interplanting of small seeds. For copies of the illustrated folders,

CIRCLE 158 ON SERVICE CARD

*See page 50 for information
on these Reader Service numbers:*

168—Delavan Plastic Nozzle

169—Piqua Controlled Volume Drum Pump

170—Union's New Uniseal Bag

159—PIPER PA-18-A

A new bulletin on the 1959 Piper PA-18-A has been prepared by Piper Aircraft Corp. Powered by a 150 hp Lycoming engine, the plane is available either as a sprayer, duster or as a combination unit. Sprayer capacity is 110-gallons; duster's hopper capacity is 18 cubic feet. To get the bulletin:

CIRCLE 159 ON SERVICE CARD

160—SAFETY RELIEF VALVE

Information on the new RegO AA3131 aluminum alloy safety relief valve for use on applicator and nurse tanks of up to 1,000 gallon water capacity is available from The Bastian-Blessing Co. The valve is UL listed as are all its anhydrous ammonia safety relief valves, according to the manufacturer. Capacity is 1740 CFM of air at a 250 psig setting. For complete information,

CIRCLE 160 ON SERVICE CARD

Miscellaneous

161—TEFLON STOCK SHAPES

An eight-page illustrated catalog from Cadillac Plastic & Chemical Co. lists available shapes and sizes of Teflon plastic they have available. Shapes catalogued include sheets, rods, tubing, tapes and cementable etched tapes, large diameter molded bars and cylinders. Permissible tolerances are given on all stock shapes as well as properties and end use applications. Manufactured from DuPont TFE resin, the plastic is said to be inert to virtually all chemicals and is usable at temperatures from -120F to 550F. For your copy

CIRCLE 161 ON SERVICE CARD

162—SHORT CUT TABLES

"Handy Reference Engineering Constants" is the title of a free brochure from The Falcon Manufacturing Div., First Machinery Corp. In addition to the constants it includes: Weights and Specific Gravities, U. S. Standard Baume Scale, Table of Degrees Brix, Steam Table, short cut engineering conversion factors, and other data. To obtain your copy

CIRCLE 162 ON SERVICE CARD

163—DUST MASKS

Flex-A-Foam dust masks for protection against the hazards of non-toxic dust are self-adjusting to any size and shape of face and comfortable, reports Flexo Products, Inc. Weighing only one ounce, the mask filters non-toxic dusts as small as 1/25,000

of an inch. New literature from the firm describes the dust mask and Flex-A-Prene paint mask. A copy is yours, just by

CIRCLING 163 ON SERVICE CARD

164—NOMOGRAPHS ON WATER AND CHEMICAL RECOVERY

Two nomographs—one on the value of recovered water and the other on the amount of waste chemical which can be recovered—have been released by Graver Water Conditioning Co. With proper treatment, waste water can be recovered and reused. Where desirable, chemical products in the water also can be recovered. To use the nomograph on recovered water, one must know the cost of makeup water in cents/M gals., and average flow through the plant. Recovered water value is obtained by drawing a straight line on the nomograph. For your copies,

CIRCLE 164 ON SERVICE CARD

165—AIR VIBRATOR

The new Navco HCP line of heavy-duty vibrators for unloading covered railroad hopper cars has just been announced by National Air Vibrator Co. Designed with a long piston stroke for maximum amplitude and thrust, the piston is the only moving part, Navco reports. According to the manufacturer, Navco Long Stroke units cut unloading time on covered hopper cars, eliminate "clean-out" of cars after emptying and free unloading personnel for other work. You can obtain details by

CIRCLING 165 ON SERVICE CARD

166—AUTO-BIN-DICATOR

Bin-Dicator Co. reports that its new, all-metal Auto-Bin-Dicator automatic bin level indicator is suitable for use with high and low density, coarse and fine materials and is highly corrosion resistant. Standard and explosion proof models with U.L. label are available. The company will be glad to send you details, if you

CIRCLE 166 ON SERVICE CARD

167—PLANT GROWTH ROOM

Labline, Inc., manufacturer of the Plant Growth Room, reports "fantastic interest" from agronomists, biochemists, and chemical research and control laboratories in the fertilizer, chemical, pharmaceutical and food fields. Plant Growth Rooms are environmental cabinets that enable scientists to control conditions of temperature, light, humidity and other natural factors pertinent to soil and plant studies. A bulletin with full information is available.

CIRCLE 167 ON SERVICE CARD

FARM CHEMICALS

NEWS OF THE INDUSTRY

(Continued from page 40)

on phosphorus in plant nutrition chaired by Dr. G. L. Bridger of W. R. Grace & Co.

Those interested in attending may write Dr. W. George Parks, Dept. of Chemistry, University of Rhode Island, Kingston, for application blanks since admission is by invitation.

WESTERN AG CHEM ASSN. PLANS OCTOBER MEETING

The fall meeting of the Western Agricultural Chemicals Association will be held in the Villa Hotel, San Mateo, Calif. on October 13 and 14, according to C. O. Barnard, executive secretary.

Panels will discuss five areas of business procedures and five aspects in marketing agricultural chemicals in the western states. At least 250 people are expected to attend.

NPFI REPORTS ON SOIL FERTILITY PROJECTS

Intensified community soil fertility projects, initiated largely through the efforts of the National Plant Food Institute, are being carried out this year in 88 counties in 14 states across the country, NPFI has announced.

These programs are designed to boost agricultural income by getting farmers to have their soil sampled and to follow lime and fertilizer recommendations furnished on the basis of soil tests.

"These might be called 'motivation studies,' because they have been established under controlled conditions and the results will be closely analyzed," Dr. Russell Coleman, NPFI executive vice president, said. "Assuming results comparable to those obtained in Georgia and North Carolina in 1958, the spread within the pilot states and in other states should be rapid in 1960."

In setting up such a program in a particular county, the Institute feels that it is necessary to gain the confidence and support of two groups:

"The state agricultural college must be convinced," Coleman said, "that the program will help to get their fertilizer recommendations generally accepted by farmers, and

the industry serving the state must be convinced that the technique will improve fertilizer sales." He added that it is "necessary to demonstrate results before widespread application of this technique in a new state or area."

During 1957-58, the Institute supported the initial project in six Georgia counties with a grant of funds and preparation of educational materials.

Some of the results of the program included a boost in fertilizer tonnage by 10.1 per cent in 1958 in the six county area while over-all sales in Georgia dropped about one per cent. Total plant food consumption was up 17.5 per cent because farmers used more of the recommended grades. In Colquitt County alone, income increased by \$3.75 million.

In terms of individual plant foods, nitrogen use climbed 27 per cent, phosphate (P_2O_5) 10 per cent, and potash (K_2O) 18 per cent. Lime use more than tripled in the six county area.

In 1958 in Hoke County, N. C. where the program was patterned after the Georgia project, fertilizer sales jumped 14.7 per cent, while sales for the state as a whole dropped 4 per cent. Farm income increased by \$1.75 million despite a decrease of 40 per cent in cotton acreage. Every farmer in the county participated.

"TASK FORCE" DISCUSSES FERTILIZATION RESEARCH IN SOUTHERN FORESTRY

The National Plant Food Institute's Forest Fertilization Task Force met March 24 and 25 at the Dinkler-Plaza Hotel in Atlanta, Ga., to discuss fertilization research in southern forestry, Dr. S. L. Tisdale, regional director of the Institute, has announced.

The project is under the direction of Dr. L. C. Walker, chief forester of the Institute. On the task force are industrial scientists and research foresters.

This project is the result of recent interest shown by chemical companies in a coordinated program. About 30 wood-producing industries also have expressed interest in such an effort, NPFI said.

Walker pointed out that research

(Continued on page 48)

Farm Market Facts

about the multi-billion dollar FARM MARKET

For a quarter of a century, Doane has been providing companies with facts to help answer questions such as these:

How will new farming methods affect the market for our product?

What product changes should we make to meet changing farming needs? Should we develop new products?

To what extent has integration developed and how will it affect our marketing program?

How does the farmer regard our company and our products compared to our competitor's?

How Doane Research Operates

To answer questions about the farm market, Doane has:

1. More than 100 agricultural college trained and experienced farm managers in 35 field offices.
2. A national panel of commercial farmers and wives, representing more than 90% of farm purchasing power.
3. Supervised testing of products under a wide range of farm conditions.
4. An experienced staff of marketing research specialists.

Doane Gives You Facts Based on Experience

Doane has a unique, down-to-earth understanding of farmers and their problems through:

- Forty years' experience managing thousands of farms and ranches.
- Twenty years of furnishing facts and forecasts to American farmers in the Doane Agricultural Digest.
- Thirty-five years designing farm buildings and farmstead layouts that save time, labor and expense.

Doane Agricultural Research has proved valuable to many leading industrial firms. If you have a marketing or product testing problem, phone Elmer Denis, Manager, Research Division, FOrest 1-2800. St. Louis, Missouri.

DOANE

AGRICULTURAL SERVICE, INC.

5148 Delmar Blvd., Box 38
St. Louis 8, Mo.

NEWS OF THE INDUSTRY

underway includes

- ▶ nutrient applications to stimulate growth of pines and hardwoods in plantations and natural stands,
- ▶ stimulation of seed production in orchards and forests,
- ▶ relation of fertilizer applications to wood quality, and
- ▶ basic nutritional studies.

Establishment of a clearing house of experiments underway—so that interested parties could be kept informed of research progress—was considered at the Atlanta meeting. The group agreed to encourage establishment of a service laboratory to handle analyses of soils and plant tissues. Priorities for forest fertilization research were suggested and requests from research organizations for financial aid were considered.

Members of the task force who attended the meeting were Dr. L. E. Loveless, Monsanto Chemical Co.; Dr. Louis Metz, U. S. Forest Service; Dr. W. W. Rennie, E. I. duPont de Nemours & Co.; Dr. J. E. Sedberry, American Potash Institute; Dr. H. J. Stangel, Allied Chemical Corp.; Donald D. Stevenson, Buckeye Cellulose Corp.; and F. W. Woods, Duke University. Dr. R. L. Beacher, Dr. W. H. Garman and E. K. Chandler, all of NPFI, also participated in the conference.

Government

TVA INVITES INDUSTRY TO JUNE DEMONSTRATION

TVA will hold another of its pilot-plant demonstrations this year to acquaint the fertilizer industry with the agency's recent developments in fertilizer production technology. The demonstration will be held on June 9, 10 and 11 at the Muscle Shoals laboratories near Sheffield, Ala.

As in the 1957 demonstration, which was attended by about 400 representatives of the industry from 34 states, Hawaii, Puerto Rico and four foreign countries, the program will consist of a series of pilot-plant runs preceded by short discussion periods. Among the subjects to be discussed: production of liquid fertilizers, granulation of high-nitrogen and no-nitrogen grades, and some factors affecting loss of nitrogen during granulation. A general resume of TVA's fertilizer research and development program also will be presented.

Tours will be arranged for those who wish to see the fertilizer manufacturing facilities and the chemical and agronomic research laboratories.

All members of the fertilizer industry, the press and other

interested persons have been invited to attend the demonstration. TVA asks that those planning to be there notify J. H. Walthall, director of chemical development, TVA, Wilson Dam, Ala.

NEW CHEMICAL TO BE TRIED AGAINST GYPSY MOTH

A new weapon against the gypsy moth will be used this spring in a field-scale demonstration by USDA and the New York Dept. of Agriculture and Markets, assisted by New York State Conservation Dept. and New York State College of Agriculture.

The chemical, Sevin, has been shown in research and testing to be effective against the gypsy moth, and will be demonstrated on infested woodland totaling about 75,000 acres. Exact acreage, USDA said, will depend on availability of the material and further evaluation of the latest tests. A carbamate, Sevin has very low toxicity to man and warmblooded animals or to fish and aquatic insect life.

USDA ISSUES HANDBOOK ON INSECTICIDE USE

The 1959 revision of Agriculture Handbook 120—*Insecticide Recommendations of the Entomology Research Div. for the Control of Insects Attacking Crops and Livestock*—is now being provided to extension agents and others who guide farmers' pest control efforts, USDA has announced. The handbook summarizes the department's recommendations as of Jan. 1, 1959.

Among the changes in recommendations for the current season: Sevin is recommended for the first time for control of the boll weevil, pink bollworm, bollworm, cotton leafworm, cotton fleahopper, stink bugs, lygus and other mirids, thrips and the cotton leaf perforator, and ethion, Kelthane and Trithion for spider mite control on cotton.

Endrin is recommended for European corn borer control on corn and for the sugarcane borer on sugarcane. It also is recommended for control of spittle bugs on corn, alfalfa and clover on a no-residue basis with the precaution not to treat after the crop is two inches high.

As a result of extensive tests in

Calendar

May 6-8. American Institute of Chemists Annual Meeting, Traymore Hotel, Atlantic City, N. J.

May 18-20. Fifth National Symposium on Instrumental Methods of Analysis, Houston, Tex. Sponsored by Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa.

May 18-20. Chemical Specialties Manufacturers Assn. Semi-Annual Meeting, Drake Hotel, Chicago.

June 9-10. Association of Southern Feed and Fertilizer Control Officials 17th Annual Convention, Velda Rose Motel, Hot Springs, Ark.

June 11-13. Manufacturing Chemists' Association Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va.

June 14-17. National Plant Food Institute Annual Convention, The Greenbrier, White Sulphur Springs, W. Va.

June 29-30. Seventh Annual California Fertilizer Conference, University

of California, Davis Campus.

June 29-30. Illinois Fertilizer Industry Conference for manufacturers and their representatives, College of Agriculture, University of Illinois, Urbana.

July 7-9. Regional Fertilizer Conference, sponsored by the Pacific Northwest Plant Food Assn. and the section's state colleges and universities, Winthrop Hotel, Tacoma, Wash.

July 29. Annual Kentucky Fertilizer Conference, Guignol Theater, University of Kentucky campus, Lexington.

Aug. 3-7. Gordon Research Conference on Biochemistry and Agriculture, Kimball Union Academy, Meridian, N. H.

Oct. 13-14. Western Agricultural Chemicals Assn. Fall Meeting, Villa Hotel, San Mateo, Calif.

Oct. 21-23. National Agricultural Chemicals Assn. 26th Annual Meeting, French Lick-Sheraton Hotel, French Lick, Ind.

Oklahoma during 1958, dieldrin has been recommended for control of flea beetles on seedling sorghum. Methyl parathion has been added to the list of materials recommended for control of green bugs on small grains.

Malathion now is recommended for Japanese beetle on blueberry, blackberry, raspberry and beans; for asparagus beetle on asparagus and for pickleworm on squash and cucumber.

Kelthane has been added for mite control on most deciduous fruits and on berries and vegetables, and Trithion for mite control on beans, tomatoes, potatoes, strawberries, and as a prebloom spray on apple trees.

Diazinon is recommended for aphids on strawberries, hops, beans, beets, celery, cucumber, lettuce, pepper, spinach, tomato and certain cole crops, and Phosdrin for the red-banded leaf roller on apple and for aphids on melons.

Use of Bayer 21/199, commercially available as CO-RAL, which was previously recommended as a supplement to AH 120 for the 1958 season for control of certain livestock pests, is incorporated in the revision, together with proper precautions for use on beef cattle, sheep, goats and swine.

The Handbook can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price is 65 cents a copy.

PROGRESS REPORT ON PHOSPHATE ROCK MINER

Bureau of Mines engineers have made significant progress toward developing equipment and techniques for mining western phosphate rock mechanically, according to a publication recently released by the Dept. of the Interior.

The report describes construction and use of the Bureau's second pneumatic vibrating-blade planer which incorporates improvements suggested by use of an earlier model.

Tests were made in the Anderson mine of the Montana Phosphate Products Co., Garrison, Mont.

A copy of Report of Investigations 5437, "Design and Test Operation of a Pneumatic Vibrat-

ing-Blade Planer—A Progress Report on Phosphate-Mining Research 1956-57," can be obtained by writing the Publications-Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa. Both number and title should be given.

Chemicals

CLIMAX MARKETS NEW MOLYBDENUM PRODUCT

A new fertilizer additive has been developed by Climax Molybdenum Co., a division of American Metal Climax, Inc., known as Moly-Gro Fertilizer Additive, the material will be marketed to fertilizer producers for blending with their products. It was developed as a companion to the recently introduced Moly-Gro seed treatment formulation, Climax reports, and is recommended for use on already established legume perennials that are growing on molybdenum responsive soil. The seed compound is most effective for annuals and establishment of new crops.

The fertilizer additive contains a minimum of 42 per cent active molybdenum. It is relatively insoluble in water, yet is completely available to plants, the manufacturer said.

NEW FUNGICIDE FROM CALSPRAY AND STAUFFER

A new fungicide has been put on the market by California Spray-Chemical Corp. and Stauffer Chemical Co. Called Phaltan, the compound is related chemically to Captan, but controls some plant diseases which Captan does not curb, Stauffer said.

Phaltan is now registered for some uses on ornamentals, potatoes and citrus. Research and field applications indicate that it is particularly effective against black spot and powdery mildew on roses; leaf spot (Septoria) on chrysanthemums; early and late blight on potatoes; citrus scab and melanose on citrus fruit. Other experimental applications indicate that Phaltan has potential for control of leaf blight on chrysanthemums; rust on carnations; Septoria, Alternaria

and Anthracnose on tomatoes; downy mildew on cucurbits, Botryosphaeria, bitter rot and black rot on apples; cherry leaf spot and brown rot on cherries; black rot and downy mildew on grapes and fruit rot on strawberries.

Against other diseases—including apple scab, downy mildew on lettuce, dead arm on grapes, late blight on tomatoes and brown rot on peaches—Phaltan is reported to be equal in effectiveness to Captan or Zineb but may have superior sticking qualities.

Chemically, Phaltan is N-trichloromethylthiophthalimide. It is insoluble in water, only slightly soluble in organic solvents.

NEW TYPE INSECTICIDE SHOWS PROMISE AGAINST ROSE MITES IN TESTS

Preparations for testing on a wide scale of a new type insecticide for greenhouse use are being made by W. R. Grace & Co. Davison Chemical Div.

USDA has accepted experimental label registration of Dri-Die Horticultural Dust 91, which will enable entomologists and nurserymen to broaden tests initiated by the University of California at Los Angeles.

This new product is related to, but different in formula from, Dri-Die Insecticide 67, for which permanent registration has been granted to Davison (FARM CHEMICALS, March). The latter product, silica gel and ammonia fluosilicate, is for use against such pests as roaches and drywood termites in houses and other structures. The horticultural dust, silica gel and magnesium fluosilicate, has been tested primarily against spider mites on roses under greenhouse conditions.

CYANAMID SELLS GRANULAR THIMET IN 3 STATES

American Cyanamid Co. on April 1 began marketing in three states a granular form of its systemic insecticide, Thimet.

Use of Thimet is recommended in Ohio, Michigan and Wisconsin, where experiment stations have conducted "extensive tests," the company reports. Clearance is for the control of aphids, leafhoppers and flea beetles on potatoes.

NEWS OF THE INDUSTRY

Equipment Supplies

FREE CIRCULAR SLIDE RULE FROM GIC



General Industrial Co. has introduced a handy circular slide rule for engineers and other plant and office executives. To multiply, divide and find proportions is easy and fast with this circular calculator. Complete easy-to-follow in-

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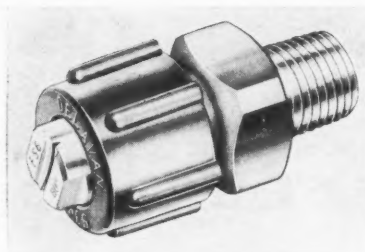
structions are included with each rule.

The rule is free to business executives and engineers; priced at 50 cents to others. Write General Industrial Co., 5738 Elston Ave., Chicago 30, Ill.

'POUR-EASY' PAIL RACK FROM MULTI-METER CORP.

With the "Pour-Easy" pail rack, any material can be poured from five gallon pails into small containers or bottles without spilling, according to Multi-Meter Corp. The rack fits all 5 gallon pails, with or without bails, and is made of $\frac{7}{8}$ "-20 gauge black enameled steel tubing and the band is 1"-19 gauge zinc plated steel.

NEW PLASTIC NOZZLE FROM DELAVAN MFG. CO.



Basic advantage of its new nylon nozzle for the agricultural sprayer industry, Delavan Manufacturing Co. reports, is its ability to withstand corrosive effects of farm chemicals, especially liquid fertilizer solutions. Nylon parts consist of nozzle cap, body and strainer. Tip can be furnished in brass, aluminum or stainless steel.

Complete details are available. Just

CIRCLE 168 ON SERVICE CARD

PIQUA MAKES CONTROLLED VOLUME DRUM PUMP

Chemicals can now be added to a solution automatically, in constant concentration, with the new Enpo controlled volume drum pump, reports its manufacturer, Piqua Machine and Manufacturing Co.

The pump operates automatically or manually and can be regulated for intermittent or continuous duty. Predetermined rate of flow can be controlled by changing cams in the pump.

Manufactured for 15, 30 and 55

gallon drums, the pumps are made of carbon steel for non-corrosive liquids and stainless steel for corrosive liquids. They will deliver 10 gallons to 12 gallons per hour to a 30 foot head, pumping from storage room directly to vat or tank, Piqua said.

More information is available. Just

CIRCLE 169 ON SERVICE CARD

UNION INTRODUCES UNISEAL BAG

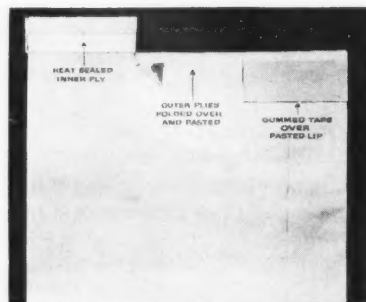
A new multiwall paper bag was introduced by Union Bag-Camp Paper Corp. at the National Packaging Exposition in Chicago last month. Called Uniseal, the bag is used in combination with a special closing machine. The result is "a completely heat sealed, liquid and air-tight package," Union reports.

Designed to hold up to 100 pounds of bulk product, the bag is constructed in the form of a tube from two to six plies of paper. The inner ply is coated with polyethylene or any other heat sealable material.

Unique feature, according to Union, is that outer plies of the bag are staggered or offset, leaving the inner ply exposed to take direct heat seal application.

For more information

CIRCLE 170 ON SERVICE CARD



Cutaway view showing Uniseal



Overall view of bag closing machine

FARM CHEMICALS

PEST REPORTS

By Kelvin Dorward*

NEW KINDS OF THE KHAPRA BEETLE

Khapra beetle, the serious stored grain pest, which was first found in this country in California in 1953 was recently found in a feed mill at El Paso, Texas. Following this find, infestations were discovered in the adjacent areas of New Mexico and Juarez, Mexico. As of April 1, 16 infestations had been found in El Paso, 10 in the El Paso trade area of New Mexico, and 2 in adjacent Juarez, Mexico.

Until these recent findings all previously known infestations in New Mexico had been eradicated and very few known infested properties remained to be fumigated in Arizona and California. Arrangements had also been completed for the handling of all known infestations in Mexico. With respect to the current infestation in the El Paso area, arrangements have been made to fumigate the properties in both Texas and New Mexico and discussions are underway with respect to the Juarez, Mexico infestations.

COTTON BOLL WEEVIL SPRING SURVIVAL SURVEY

The cooperative survey consisting of collection and examination of surface woods trash to determine the number of **boll weevils** surviving the winter was completed by the last of March in six states. Collections were made in the Louisiana Parishes of East Carroll, Madison, and Tensas. The average number of live weevils per acre found was 2,246 compared with 1,480 in the spring of 1958. During the 23 years that entomologists at the Tallulah, Louisiana Research Station have maintained these records on Madison Parish, the number of weevils per acre (3,026) found this spring has been exceeded only one time. In 1956, 3,654 live weevils per acre were found.

*Chief Staff Officer, Survey & Detection Operations, Plant Pest Control Div., Agricultural Research Service, USDA.

Boll weevil survival count average in Mississippi was slightly higher this year than last year—464 compared with 392 in the spring of 1958. The per cent survival of the number of weevils entering hibernation last fall was 12. In 1958 there was a 6.6 per cent survival.

Average spring survival boll weevil counts in Georgia averaged less than half those of one year ago. Average counts for the four regions sampled were 329 live weevils per acre of surface woods trash this year, compared with 731 in 1958. The per cent survival this year was 29, which is the second lowest in the 8 years records which have been maintained.

Survival counts in the Carolinas and Virginia varied considerably. In the south central area of South Carolina and Coastal Plains of North and South Carolina, counts were well above 1958. This spring the respective counts for these areas were 699 and 963 compared with 457 and 403 last year. In the Piedmont area of North and South

Carolina, the north central area of North Carolina and Virginia counts were similar to those of 1958. The accompanying table briefly summarizes the counts of surviving cotton boll weevils found this spring.

POTATO PSYLLID SURVEY

During early March **potato psyllid** surveys were conducted on overwintering hosts in the southwestern part of the United States. The potato psyllid causes the psyllid yellows of potatoes and tomatoes.

In all areas surveyed except the Howard County and Terrell-Pecos-Brewster areas of Texas counts were much higher than in 1958. The wild host surveyed, lycium, was abundant and well advanced in Arizona and California, but mostly dormant in the Las Cruces, New Mexico, area. In Texas, with the exception of the El Paso area, plants were generally dormant and droughty conditions prevailed.

The survey indicates a potentially severe outbreak for the 1959

BOLL WEEVIL SURVIVAL—SPRING 1959

State	Areas or District	Average No. Weevils Per Acre	
		1959	1958
North and South Carolina and Virginia	South Central South Carolina	699	457
	Coastal Plains—North and South Carolina	1,963	403
	Piedmont—North and South Carolina	242	296
	North Central North Carolina	81	54
	Southeastern Virginia	27	54
Georgia	Northwest	0	97
	North Central	726	1,307
	East Central	48	968
	South	145	532
Mississippi	Lower Delta	781	418
	Central Delta	364	551
	North Delta	284	381
	Hill Section	429	219
Louisiana	Northeast	2,246	1,480

POTATO PSYLLID SURVEY ON OVERWINTERING HOST

State	District	Average No. Per 100 Surveys		
		1959	1958	1957
Texas	Howard County	24	227	516
	Terrell-Pecos-Brewster	130	181	129
	El Paso	42	6	158
New Mexico	Las Cruces	54	7	158
Arizona	Phoenix-Tucson	992	93	95
California	Blythe-Barstow	237	96	143

PEST REPORTS

season providing weather conditions are favorable for development. The accompanying table gives comparison of numbers of potato psyllids collected in the various areas.

GENERAL INSECT ACTIVITY

The **greenbug**, by the latter part of March, was building up to rather high populations in various grain-growing areas. In Tillman County, Oklahoma, by the middle of the month approximately 20,000 acres of grain had been treated for the insect. Barley, rye, and wheat were all reported as receiving some damage in various areas of Oklahoma. Although natural enemies were not numerous, it was expected that the potential damage would be greatly reduced if better growing conditions developed.

Spotted damage from the greenbug was apparent in Hansford County, Texas. The insect was found in nearly all of the panhandle and rolling plains counties sur-

veyed. Heavy populations were also present in several central and north central Texas counties.

Although reported from New Mexico, Arkansas, and Louisiana, populations of the greenbug were generally light in those states.

The **spotted alfalfa aphid**, during March, caused local damage in parts of Texas, New Mexico, and Nevada. Populations were reported as light in Arizona, Kansas, and Oklahoma. There was a definite increase in populations in the latter state by the last of the month.

The **alfalfa weevil** was very active by the latter part of March, being numerous in Delaware, Maryland, and Virginia, and damaging in South Carolina and Georgia. Controls were necessary for the insect in Nevada and Utah.

Several important fruit insects were also active by late March. The first **plum curculios** were appearing from hibernation in

Georgia. One commercial orchard had a count of 5 adults per tree which is considered a very heavy population.

Tent caterpillars were causing east Texas fruit growers concern and egg masses of these insects were numerous in the Ogden, Utah, area.

The **apple grain aphid** was hatching in Delaware, as was the **apple aphid**. The apple aphid was also hatching in Washington State by late March and the insect was readily found in all Vincennes, Indiana, orchards examined March 30.

The **green peach aphid** was heavy on early lettuce in Yolo County, California, but by March a fungus had reduced populations to a low level. This insect was increasing on lettuce and potatoes in Maricopa County, Arizona, and was found to be light on tobacco beds in four Georgia counties. ▲

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PATENT REVIEWS

F
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By Dr. Melvin Nord

MANUFACTURING PHOSPHORIC ACID

U. S. 2,865,713, issued Dec. 23, 1958 to Oran L. Culberson and William A. Pardee, assigned to Gulf Research and Development Co., describes a process for the manufacture of phosphoric acid.

High grade crushed phosphate rock, with or without the addition of coke, is introduced into a rotary kiln, where it is heated to a temperature of 1850°F. and is coated with liquid petroleum asphalt. The asphalt is applied to the phosphate rock at a number of points in the kiln, and is coked onto the phosphate rock during the roasting, thus forming an intimately combined and highly reactive aggregate of phosphate rock and coke. This aggregate is introduced at a high temperature into a blast furnace in the absence of added silica or other fluxing medium, and is smelted with a hot blast at 2300°F. The blast furnace gases are burned to oxidize the smelted out phosphorus to form phosphorus pentoxide. The pentoxide is hydrated to phosphoric acid, and the phosphoric acid is finally separated from the accompanying gases.

FERTILIZER PROCESSES

U. S. 2,862,788, issued Dec. 2, 1958 to William N. Stanley, Jr. and William B. Dancy, assigned to International Minerals and Chemical Corp., describes a process for the purification of impure solid-phase kainite containing sodium chloride, for the recovery of potassium and magnesium values.

U. S. 2,864,685, issued Dec. 16, 1958 to Charles E. Waters and Joseph A. Smith, assigned to Allied Chemical Corp., describes a process for making mixed fertilizer containing ureaform.

A superphosphate is mixed with a metallic base in an amount equal to 1.4-1.9 mols equivalents of base per mol of P_2O_5 in the phosphate, and a urea-formaldehyde resin fertilizer is mixed in and blended to form a mixture with a pH of 6.0-7.5. The product is a mixed fertilizer which is stable, uniform,

non-hygroscopic and granular, and has a high total plant food content which becomes available to plants over a long growing period.

INSECTICIDES, FUNGICIDES AND NEMATOCIDES

U. S. 2,862,847, issued Dec. 2, 1958 to W. E. Craig and Chien-Pen Lo, assigned to Rohm and Haas Co., describes metallic arenethio-sulfonates which are highly active fungicides and can be applied to control fungal diseases. The compounds disclosed are zinc, lead, mercury, and iron salts of the following acids: benzenethiosulfonic, chlorobenzenethiosulfonic, and methylbenzenethiosulfonic.

U. S. 2,863,801, issued Dec. 9, 1958 to Engelbert Kuhle, Richard Wegler, and Ferdinand Grewe, assigned to Farbenfabriken Bayer Aktiengesellschaft, discloses the use as fungicides of O-carboxylic acid esters of cyclic oximides.

U. S. 2,863,802, issued Dec. 9, 1958 to William J. Pyne, assigned to Diamond Alkali Co., discloses the use as fungicides of 2-(3,3,3-trihalo-2-hydroxypropyl) pyridines.

U. S. 2,863,803, issued Dec. 9, 1958 to Isaac Benghiat et al, assigned to Stauffer Chemical Co., discloses the use as fungicides of diphenyl and dialkyl 1,2,4-thiadiazolidines.

U. S. 2,864,735, issued Dec. 16, 1958 to Roy E. Stansbury and Lyle D. Goodhue, assigned to Phillips Petroleum Co., provides a method for rendering soils nematocidal in character, employing selected cycloparaffins for this purpose.

U. S. 2,864,737, issued Dec. 16, 1958 to Ellis K. Fields, Roger W. Watson, and Melvern C. Hoff, assigned to Standard Oil Co., discloses the use as fungicides of compositions consisting of molybdenum and vanadium derivatives of phosphorus sulfide-hydrocarbon reaction product.

U. S. 2,864,738, issued Dec. 16, 1958 to Carleton B. Scott and

assigned to Collier Carbon & Chemical Corp., discloses fungicidal compositions in which the active ingredient is a product obtained by reacting a dimethyl dialkyl ketone mercaptol with elemental sulfur.

U. S. 2,864,739, issued Dec. 16, 1958 to Carleton B. Scott and Irving D. Webb, assigned to Collier Carbon and Chemical Corp., discloses fungicidal and nematocidal compositions consisting of certain sulfurized dimethyl mercaptals.

U. S. 2,864,740, issued Dec. 16, 1958 to William R. Diveley, discloses the use as insecticides of beta-alkylmercaptovinyl dialkyl phosphate and thiophosphate.

HERBICIDES AND PLANT GROWTH REGULANTS

U. S. 2,864,679, issued Dec. 16, 1958 to Philip C. Hamm and Angelo Speziale, assigned to Monsanto Chemical Co., discloses a method of inhibiting the growth of grasses in the presence of other vegetation, with compounds related to N-benzyl alpha-chloracetamide.

U. S. 2,863,753, and **2,863,754**, issued Dec. 9, 1958 to Ralph L. Wain, assigned to National Research Development Corp., describes a new class of compounds with herbicidal properties, e.g. γ -(2-methyl-4-chlorophenoxy)butyric acid.

U. S. 2,864,680, issued Dec. 16, 1958 to Edward R. Degginger, assigned to Allied Chemical Corp., discusses the use as herbicides of compounds related to 1,4,5,6-tetrachloro-2-acetoxy-bicyclo-(2.2.1)-heptene.

U. S. 2,864,681, issued Dec. 16, 1958 to Louis G. Nickell, assigned to Chas. Pfizer and Co., Inc. discloses the fact that the synthetic organic compound known as isonicotinic acid hydrazide or isoniazid acts as a plant growth stimulant, particularly for stimulating the germination of seeds. ▲

Part 2:

Developments in

The manufacture of superphosphate, one of the oldest and most important operations in the fertilizer industry, has undergone important changes and developments in the past decade. The purpose of this paper is to review these developments and to evaluate the current status of superphosphate production technology.

There are several good basic reviews on superphosphate in the fertilizer literature. Among the latest are those by Waggaman (36), Siems (33), and Jacob (19). Since these include accounts of the history of the industry and good descriptions of the basic practice, the present review is restricted mainly to recent innovations and to the current status.

Superphosphate Production

By A. V. SLACK*

In this issue, the author concludes his unique study of superphosphate manufacture, with discussions of developments in the manufacture of enriched superphosphate, triple superphosphate and highly concentrated superphosphate. Developments in the manufacture of ordinary superphosphate were covered in the April issue of FARM CHEMICALS.

ENRICHED SUPERPHOSPHATE

The main use of ordinary superphosphate is in supplying the P_2O_5 content of mixed fertilizers. In the earlier years of the industry the P_2O_5 concentration in superphosphate was adequate for any of the mixes made; in fact, filler had to be added in many grades to keep the P_2O_5 down to the desired level. As higher analyses came into use, however, there came into demand grades with P_2O_5 contents so high that they could not be made with ordinary superphosphate. One of the ways of treating this problem is to substitute triple superphosphate for ordinary superphosphate in an amount sufficient to bring the mix up to grade. This is the principal method used at present. However, some producers of ordinary superphosphate have tried to make a higher grade product rather than cutting back on ordinary superphosphate production and buying triple superphosphate elsewhere. This has been done usually by replacing part of the sulfuric acid with phosphoric acid. The resulting product is called enriched superphosphate.

Most of the interest in enriched superphosphate was in the period 1952-56. Yates and Fox et al. (37)

reported work in 1953 on mixing, denning, and curing characteristics of the material. The Bureau of the Census (35) first mentioned the product in the 1953 report and reported it separately in 1954. Production has been as follows:

Year	Tons produced
1954.....	40,360
1955.....	39,042
1956.....	12,888

The production was not reported separately in 1957 since only two plants reported manufacture of the material.

One factor in the decline of enriched superphosphate is that most producers have used relatively expensive furnace phosphoric acid because wet-process acid was not available on the market. This practice is at an economic disadvantage in comparison with production of triple superphosphate from wet acid. The wet acid has been practically all captive acid used by the large triple superphosphate producers, who have no great incentive to make enriched superphosphate.

Another factor is the trend to use of phosphoric acid instead of sulfuric acid in granulation. The phosphoric acid furnishes the concentrated P_2O_5 required for supplementing the ordinary superphosphate used and also furnishes heat of reaction from neutralization with ammonia. Still another consideration is that triple superphosphate can be produced in an ordinary superphosphate den about as easily as the enriched type, and is a more concentrated product.

TRIPLE SUPERPHOSPHATE

Triple and ordinary superphosphate differ considerably in the technology of production and use. The triple superphosphate plants are much larger on the average, are located near the phosphate deposits,

*Tennessee Valley Authority, Wilson Dam, Ala.



Slurry-type triple superphosphate plant

Dorr-Oliver, Inc.

and tend more to continuous operation. Much of this difference is due to the fact that triple superphosphate production requires phosphoric acid. Since this has not been generally available on the open market, as has sulfuric acid, the producer has had to make it. The phosphoric acid process is more complicated than that for making sulfuric acid and therefore the trend has been to large plants and continuous processing in order to reduce investment and operating cost per unit of production. The size of the plant and the high concentration of the product have been factors in locating the plant near the source of ore.

Some triple superphosphate is made in smaller plants from purchased phosphoric acid. Department of Commerce reports show about eleven such plants in 1957. However, the amount produced is relatively small; most of it is made in ordinary superphosphate equipment.

Triple superphosphate has been made from both electric-furnace and wet-process phosphoric acid. At present, however, all the major plants use the latter. Production was stopped at the single major plant using furnace acid in 1957. There is still some use of furnace acid by small plants but the tonnage produced is not significant.

Triple superphosphate production technology has changed rapidly in the past few years, mainly because of the rapid increase in production. Since most plants now operating have been either built or expanded since 1950, there has been opportunity for installing new processes and equipment. Practically all the new plants are of the continuous type; only one completely batch operation is reported among the major plants.

PROCESS TYPES

As pointed out by Siems (33), the history of triple superphosphate technology has been closely tied in

with that of wet-process acid. The processes used have been fashioned to suit the concentration of acid available. In 1950, the general practice was to use acid of low or medium concentration, cure the product, and dry it. No new installations of this type have been reported in recent years. Concentrating the acid has been generally recognized to be less troublesome than drying the superphosphate. Therefore, processes based on acid of low or medium concentration (below 45 per cent P_2O_5) now occupy a relatively unimportant place in production of storage-cured triple superphosphate.

Storage Curing The majority of plants now use strong acid (50 to 55 per cent P_2O_5) in processes involving continuous mixing, continuous denning, and storage curing. Within this broad description, however, each company has tended to introduce innovations and combinations of its own. As a result, the situation is different from that in ordinary superphosphate production, where a particular process may be used in many plants.

In the mixing step, there has been a strong trend to use of the cone mixer. This mixer was developed originally for use in production of triple superphosphate from electric-furnace acid (3). Companies now using it for wet-process acid have made some changes in dimensions to get optimum results with the different acid.

Of the 15 triple superphosphate plants now in operation, 9 use the cone mixer. One or two companies use pan mixers and a few have special mixers designed by their own staffs.

For the denning step, the use of a conveyor belt (3) has been widely adopted. The belt is more appropriate for triple than for ordinary superphosphate because of the quicker setting time of the former when strong

PRODUCTION METHODS

For many years, superphosphates have supplied more than 85 per cent of the domestic production of available phosphorus in fertilizers, and the normal material has accounted for most of the output. Spurred, however, by continually rising labor, handling, and transportation costs the trend has been steadily to the more concentrated types of superphosphates since World War II. Thus, triple superphosphate accounted for 39 per cent of the production of phosphorus as superphosphates in 1958, as compared with only 8 per cent in 1945. Triple superphosphate can be expected to command an even larger share of the future tonnage of such phosphorus, but at a smaller rate of increase. Keener competition from other concentrated phosphates, including ammonium phosphate and liquid phosphoric acid, is anticipated.

K. D. JACOB
Chief, Fertilizer Investigations
Research Branch
Soil and Water Conservation Research Div.
U. S. Department of Agriculture

acid is used. There are now eight or more plants using belts. The remaining plants are divided among various den types, including Sturtevant, Broadfield (modified in some cases), and original designs.

Phillips et al. (26) have described pilot-plant tests on use of a rotary drum to take the place of the usual belt or den in a process which combines acidulation with granulation. Phosphoric acid and steam are fed under a rolling bed of phosphate rock and recycle through perforated pipe distributors. The granules formed in the drum are compacted and rounded in a second rotary drum, cooled in a rotary cooler, and screened. The product had high conversion after 1 to 2 weeks of curing, could be ammoniated efficiently, and did not cake in storage.

Slurry Process A triple superphosphate process which involves quick curing and granulation has attracted considerable attention in recent years. It was developed by the Dorr-Oliver company and was first used in 1931 by the Consolidated Mining and Smelting Company of Trail, British Columbia. The process involves treating rock with acid of intermediate concentration (38 to 41 per cent) in a series of reaction tanks. Granulation is accomplished by mixing the slurry with recycled dry fines in a pugmill "blunger." The granules are dried in a rotary dryer. After screening and grinding of oversize, the fines are recycled. The onsize granules are ready for shipment.

Ammonium phosphates can also be made in Dorr-type plants. The early installations were used mainly for this purpose but in 1951 a plant was built in England for production of triple superphosphate as the primary product (1). A similar plant was put into operation in Florida (16) in 1954. It has been reported recently that a plant in Mexico and a second plant in this country are under construction.

Several installations of the slurry process have been made, or are under construction, in this country for

production of ammonium phosphates. These might be considered as triple superphosphate plants since the product can be made in them. However, so far companies have restricted their operation pretty well to one product or the other, and they are classified on that basis in this survey.

The slurry process gives fairly good quick-curing. Porter and Frisken (27) reported 98 per cent conversion of P_2O_5 to the available form (in the product from the dryer) with Moroccan rock, and Inskeep, Fort, and Weber (16) listed 96.3 per cent for Florida rock. The product is quite spherical and therefore has an attractive appearance. It is also quite hard and dense as compared to triple superphosphate made by other processes. These qualities make it very good for direct application but unfortunately the same qualities are adverse to ammonia absorption—even when the granules are ground—when the material is used in mixed fertilizer production. This is of little consequence abroad where ammoniation is not widely practiced, but in this country it is a handicap. It was announced recently (10) that the producer using the slurry process in this country has added a cone mixer and storage-curing unit to the plant in order to produce ammoniation-grade superphosphate.

Quick Curing The slurry process accomplishes quick curing but requires a new plant. Some producers have tried to add facilities for quick curing to existing mixer-den installations but no successful operation has been reported. Bridger (3) reported on quick-curing tests with triple superphosphate made from electric-furnace acid. Fresh superphosphate was dried under conditions designed to promote rapid conversion. Good results were obtained in pilot-plant tests.

As noted earlier, drying of triple superphosphate was practiced widely when acid of low or intermediate concentration was used. Presumably the drying step could be used to accelerate conversion. However, conditions favorable to quick curing apparently were not attained in these processes since the superphosphate was allowed to cure in the pile for a few weeks.

Production in Ordinary Superphosphate Dens

Triple superphosphate can be made in an ordinary superphosphate den. The main difference—when strong phosphoric acid is used—is that the mix tends to set up faster. Yates and Fox et al. (37) studied this problem and concluded that if the water content of the phosphoric acid is kept between 25 and 27 per cent any type of ordinary superphosphate den should give good results. Dee et al. (11) have also reported studies on triple superphosphate production in dens for ordinary superphosphate.

Such practice is not a very important part of the industry. As noted earlier, there are 11 producers who presumably use ordinary superphosphate dens. These have the same handicap as the enriched superphosphate producers; most of them must buy their phosphoric acid and only relatively expensive furnace acid has been available, at least until recently. A few are able to obtain spent phosphoric acid from nearby industries but the amount involved is relatively small.

HIGHLY CONCENTRATED SUPERPHOSPHATE

In the last 5 years there has appeared a class of superphosphates which, for want of a better term, is called highly concentrated superphosphate in this survey. Most of the superphosphate made with wet-process or furnace phosphoric acid runs between 42 and 48 per cent total P_2O_5 . The new classification is for superphosphate running more than 50 per cent P_2O_5 . Or perhaps a better distinction is that the new product is made by use of different raw materials or a radically different process to give higher concentrations than are possible for triple superphosphate. Two types of products have been developed which fit this description.

In 1954 a product called "multiple superphosphate" was introduced which contained 56 per cent available P_2O_5 (8). The material was made by a process involving leaching of ordinary superphosphate and stepwise neutralization of the filtrate to make feed-grade dicalcium phosphate. Filter cake from the latter step was mixed with more superphosphate extract and dried to give the high-analysis fertilizer product (20). Production of this material was discontinued after a year or so.

Phillips et al. (25) have reported on work done at TVA on the reaction of phosphate rock with very strong furnace acid ("superphosphoric acid," 76 per cent P_2O_5) to make a highly concentrated superphosphate. The acid consists of about half orthophosphoric and half pyrophosphoric acid. Enough water is added to give the equivalent of 100 per cent orthophosphoric acid or a little above. Since there is little free water present, anhydrous monocalcium phosphate is produced and the phosphate content of the product is thereby increased over that of standard triple superphosphate. The relatively high degree of fluorine evolution (around 60 per cent) also contributes to the high grade. A typical product contains 54 per cent available P_2O_5 .

Highly concentrated superphosphate is being made by this method on an experimental plant scale. The material has been used in mixing plants with good results.

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Manufacturing is on the move; will marketing "catch up"?

We cannot help but dream a little and wonder where the farm chemicals industry would be today if marketing had kept pace with production. Perhaps "down time" would have been drastically reduced among sales personnel if comparable "basic tools" had been established and followed in marketing that have become commonplace in manufacturing techniques.

Recently, the National Industrial Conference Board pointed out that "between 1947 and 1957 the number of white-collar workers in manufacturing has increased from 16 per cent of total employment to 23 per cent."

Reporting on this change, FACTORY magazine said that this "results from rising manufacturing productivity, which basically calls for fewer producers and more controllers, planners, and managers of production."

Last December, an interesting Fertilizer Industry Roundtable report was discussed in this magazine. Jesse C. Jessen of E. I. du Pont de Nemours & Company pointed out that *the maintenance labor wage roll force showed an increase of 250 per cent of the 1940 base—or growth six times as fast as all other wage roll.*

Jessen suggested 18 basic tools "to keep the plant running smoothly." These tools interested us so much that we listed them in the article reviewing the proceedings of that important meeting.

But even as we kept them in mind for production men, we delved into the abstract world of marketing—looking for a "sign" which would indicate to us how these excellent tools might be applicable to the specialist concerned with such things as a new modification of motivation research or some other marketing tool.

Impossible? Perhaps, but it might be worth exploring! Jessen's "tools" are listed first in bold face type, followed by the writer's "comparable marketing practices." Space demands that they be more brief than desired.

1) Set up a proper maintenance organization. Select efficient supervisors, planners and managers who have a good understanding of the sales goals.

2) Establish a work order system. Set up a workable merchandising calendar. (Example: page 22, January issue).

3) Keep equipment records. Constantly study and evaluate your sales training tools.

4) Analyze and plan jobs. Place the right

man in the right job. Don't hesitate to make changes.

5) Make weekly forecasts. Allot time for vacations, meetings, in-service training, etc. Determine actual work days.

6) Prepare daily schedule. Organize salesman's work for more effective use of his time—such as preparation, interviewing, making up reports, "in-between" interviews.

7) Establish a preventive maintenance program. Create high morale by providing incentive plans, sales contests, bonuses, professional improvement, adequate vacations and company entertainment.

8) Set up major overhaul procedures. Have a plan to remedy any crisis, for the good of the sales plan. Example: territory revisions.

9) Develop standard practice. Be sure the detailed work plan is understood and followed by all. This could include a) map of territory, b) workload analysis, c) plan of work for each territory, including a complete recap of each customer and potential customers. What has been bought in the past and current years—plus potential.

10) Use work measurement. Interview each salesman and receive impressions of what *he expects* the sales plan to accomplish, where the bottlenecks are, weak spots in the territory—and suggested changes.

11) Improve your equipment. Use up-to-date communications methods, such as exhibits (see page 28, April issue) and filmstrips (see page 18 this issue).

12) Train your supervisor. He must work with a goal in mind. It's his responsibility to *produce at low unit cost.*

13) Train your maintenance men. Hold schools and workshops for salesmen and dealers.

14) Analyze performance and cost. How well salesmen perform depends on how well they accept the sales plan. Make sure that no personnel are costing you money. Reward the good performers.

We think that these basic tools apply as well to marketing as to production. We doubt that there ever will be "automatic salesmen." However, the revolution that has taken place in manufacturing techniques is bound to have a decided effect on the marketing end of the farm chemicals industry.

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